Mining Journal

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The Silver Hill Underground Hoisting Station

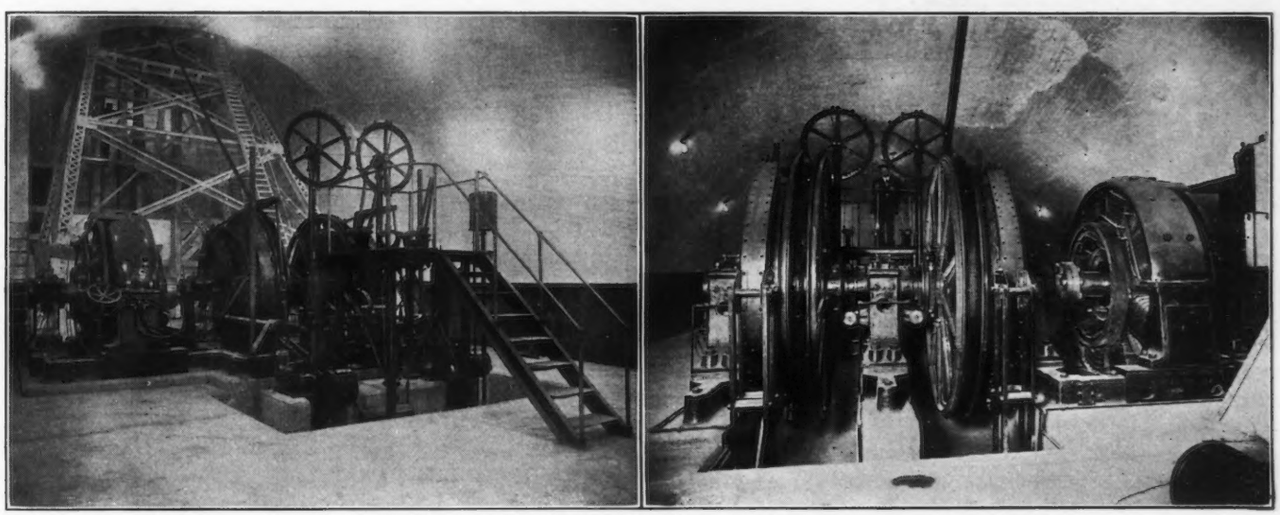
By James Humes*

SYNOPSIS—Unusually large underground shaft station cut in swelling ground traversed by a fault. Reinforced concrete used. Station is equipped with air compressors, blacksmith and carpenter shops, large hoist, all electrically driven, and a steel headframe. Total cost equipped, $104,070.

The largest underground hoisting station known to me is on the property of the Silver King Coalition Mines Co., of Park City, Utah, and is situated about in the center of the southwestern half of its holdings.

The western edge of the city limit is just about the eastern ore limit of this district, so far as known at the present time, and the King Coalition is mining 100 tons of ore per day within 1,400 ft. of the city limits and of the Denver & Rio Grande and Union Pacific railroads. This shaft is 1,300 ft. deep and the lowest level is the mine's best producer; in fact, it is from the 1,300-ft. level that most of the shipping ore comes. The general course of this level is westerly, and the innermost workings are within 2,500 ft. of the Silver Hill shaft. This level measured along the main haulage way is about 1½ mi., and the length of the orebodies will measure fully half this distance. There are stopes working close up to the face of the main drift, and some of the ore is as high-grade as any that has been mined in the past and there is one-third of the company's undeveloped territory ahead of this level, in nearly the center of which is the Silver Hill shaft.

The Silver Hill shaft is at the inside end of the Alliance tunnel, which is 9,400 ft. long and is connected with



ELECTRIC HOIST IN SILVER HILL UNDERGROUND STATION

300 ft. higher than the main street. This ore has to be hauled back into the mountain for about a mile, to the main hoisting plant, the haulage being accomplished by a 15-hp. electric locomotive, which delivers the trains of loaded ore cars at the 900-ft. level of the shaft. There is very little development work below the 900 level, east of the shaft. At this shaft, on the surface, are the shops, sampler and mill, hence all ore is brought to this point. Here also is the upper terminal of the aërial tramway that carries all crude ore and concentrates to the tracks the main Silver King shaft at the 500-ft. level by a 2,200-ft. crosscut. Both the crosscut and tunnel are laid with 30-lb. rails which make a speedy track for haulage purposes. It is intended to take all waste out to the portal of the tunnel and the ore to the Silver King shaft. The Silver Hill station is 1,650 ft. vertically below the surface.

From this description it will be seen: That the orebodies on the 1,300-ft. level as far southwest as is known show just as strong and as high-grade as any heretofore mined; that this level is getting so far ahead of the ventilating channels that it makes the ventilating problem

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a serious one; that more than one-third of the undeveloped ground of this company lies southwest of these workings; that a large tonnage of ore will be mined above the 1,300 level and toward the new shaft, that could not be handled through the 1,300 level except at great cost. These are the main reasons for the Silver Hill shaft and the big station. The original plans evolved for a compressor and hoist room were carried out.

The plans called for a steel headframe, height to center of sheave, 38.5 ft.; sheaves 6 ft. diameter. Afterward this headframe was raised 8 ft. on concrete pedestals, making the height to center of sheave 46.5 ft. This change was a great improvement and was necessary to accommodate the skips, and it also placed the horizontal members of the headframe well up out of the way for handling long material into the shaft.

It so happened that a fault cut through the excavation, about in line with the dividing wall between the engine and compressor rooms; this added greatly to the cost of excavating and concreting these rooms.

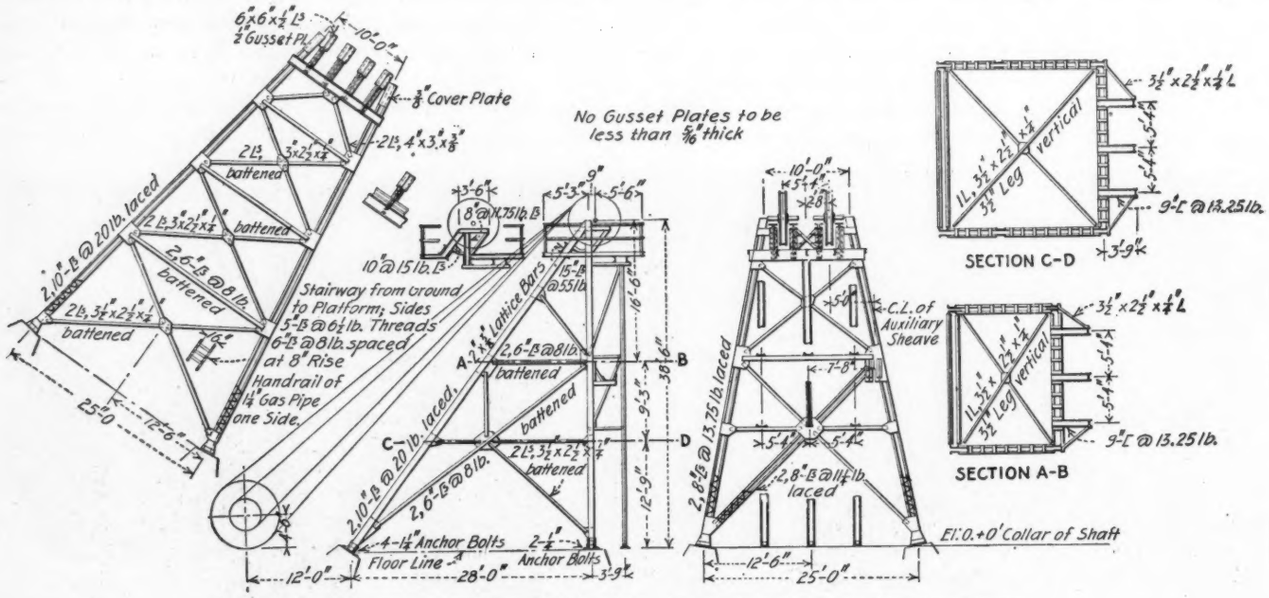
The width of the rooms being determined, work was started mining out a slice of rock the full width of the rooms and about 9 ft. high. While this undercut was being made, timber bulkheads and stulls were used to hold the back; this timber was of inferior grade, and most of it had been used in the mine before, so that it was not used for some purpose afterward. In the engine and compressor rooms were two floors of this kind of timbering and numerous stulls.

Very little powder had to be used after the undercut was taken out; indeed, the greatest concern was to prevent too much of the back from coming down. Two-inch plank was used for the wall forms, and 2x4's placed on edge over the arches.

The wall foundations were carried down below the floor level, and before placing the concrete a considerable number of holes were drilled with jackhamers, and in these holes were placed old car axles to give a bond. As the straight walls went up plenty of old rails were used for reinforcing.

A 1 to 3 mixture was used, with all the coarse rock it would cement—about 5 parts; this coarse rock was kept away from the face of the concrete about 1 in. In concreting the arches crushed rock was used which was put through the mixer with the cement. The sand was obtained from the mill, being taken from the Garfield roughing tables when the mill was running on carbonate ores. The cement used was made by the Portland Cement Co. of Utah, the works being in Parleys Cañon, near Salt Lake City.

This room is 44x25 ft. in the clear; the walls are 14 ft. to the spring of the arch and vary in thickness from 2


No Gusset Plates to be less than ⅜" thick
Stairway from ground to Platform; Sides 5"-B @ 6½ lb. Threads 6"-B @ 8 lb. spaced at 8" Rise
Handrail of 1¼" Gas Pipe one Side
battened
laced
Lattice Bars
C.L. of Auxiliary Sheave
Vertical
Leg
SECTION C-D
SECTION A-B
4-1¼" Anchor Bolts
2-1" Anchor Bolts
Floor Line
El: 0.+0' Collar of Shaft

UNDERGROUND STEEL HEADFRAME, SILVER KING COALITION MINES

necessary to protect it from the blasts. When this undercut was taken out working lines and points were established from the shaft, which was at this time about 275 ft. in depth. From these established points sills were laid down that were to carry the false work, or timbers. These sills were level with the top of the wall plates of the shaft timber and parallel with same. All lines, angles and heights were afterward taken from these sills, hence the importance of getting them right in the beginning.

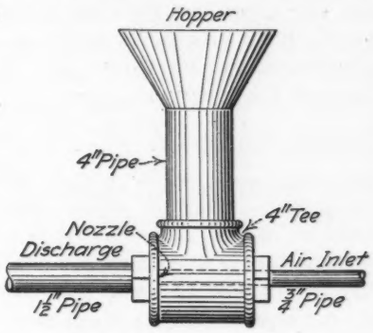
On these sills were erected square sets of the very best 10x10 Oregon fir; the caps and girts were cut the exact length of shaft posts and the posts are the right length to make end plates for the shaft, so that all of this timber will be used in the shaft. In fact, in all of this work the lumber that was used was so planned that it could be

to 5 ft. The arch is elliptical, the major axis horizontal, and is supported in the center by two 18-in. I-beams, 48 ft. long. These I-beams had to be cut in two to get them into place and for transportation through the tunnel. They are supported in the center by a 12-in. extra-heavy pipe filled with cement, with a 24-in. hydraulic flange on each end. Resting on these beams and conforming to the curve of the arch are 80-lb. rails. These overlap on the beams and are spaced 3-ft. centers; the construction has the appearance of the backbone and ribs of a mastodon. Wherever the rock in the roof looked sound enough, long holes were drilled with stoping machines and an eye-bolt split at the end for a wedge was driven up into the bottom of the hole with a specially made hammer inserted in the chuck of the drill. Through the eye

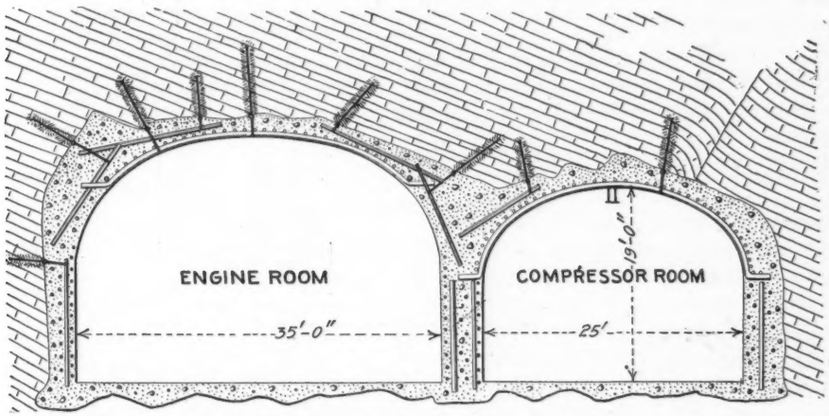
of these bolts and about the curved rails was bent steel cable; the ends were fastened together with the usual cable clamps. These loops were used wherever possible.

Discarded 4-in. boiler flues were placed on top of the curved rails, letting them lap at the ends. Thus they were 4 in. apart, except where they lapped, but before placing these tubes a network of small wire cable—discarded lacing from flat ropes—was woven from rail to rail in zigzag fashion. This network of wire was started at the spring of the arch and as it was brought up toward the center, the boiler tubes were placed in position. When a section was fixed in this manner, a coffer-dam was rigged at the open end and the pouring of the cement commenced.

The concreting of this room was a difficult matter, as the timber was set so close to hold the back that it was not easy for the men to handle the material and tools. When a man had no longer room to work above the reinforcing material, the space was filled with rock about as large as a man's hand. When the aperture was just about as full as could be of that-sized rock, a pipe was put through the forms, up through the loose rock and within ¼ in. of the rock in place; a second pipe was placed in the same manner, except that this one was pushed up against the solid back and then withdrawn ½ in. This last was the discharge pipe for the cement; the other was the discharge for the compressed air that carried up the cement which was forced up into the cavity with an air pressure of between 40 and 60 lb. This was continued just as long as any cement would be taken up. When the air would not take up any more, it was allowed to stand for 24 hr., when it was given another "shot." This was repeated several times. The concrete distributor is shown in the illustration.



CONCRETE DISTRIBUTOR



SECTION THROUGH SILVER HILL UNDERGROUND STATION

Method of Building the Engine Room

The engine room is 50x35 ft. The 35-ft. span has no other support than that given to it by the reinforcing steel. The curve of the roof, like the compressor room, is elliptical. The spring of the arch starts at the floor level and rises toward the shaft at an angle of 16° and then 37° until the ascending arch terminates with a height of 50 ft. Below the spring of the arch curved rails were placed on end and about 2 ft. apart; they extend above the spring of the arch from 7 to 8 ft. and were placed close to the face of the concrete. Long holes were drilled into the rock walls, in which were placed 1-in. eye-bolts to which the rails were tied by ⅞-in. wire ropes; some of the rails had as many as three such supports. The idea of reinforcing in this manner was to take all the strain possible off the main steel arches, or girders. These curved-steel girders were made of 4x4x½-in. angles bolted in pairs and placed 2-ft. centers. These also were supported by eye-bolts and wire ropes and laced with single strands taken out of the old tramway cables.

While the cement work of the hoist-engine room was in progress, work was carried on cutting out and timbering the space for the steel headframe. The timbers for this section had to be so spaced that the crossbeams would clear the headframe members. The first section, or floor as the miners called it, had 20-ft. posts, all timber being the best 12x12 Oregon fir. No sooner had this first floor been placed than men had to be put at work easing the rock from behind the posts on account of swelling ground, and from that time on a crew of miners had to be kept at that work. This did not look very promising for a permanent job.

When all the rock was out and the space ready for the headframe, the concreting of the engine room had been finished and all the forms were out, showing a clear space 35x50 ft., which looked so well that orders were immediately given to concrete the space required for the headframe and chutes. In doing this last, forms were put outside of the 12x12 timbers. The vertical walls of this section were well reinforced with 60-lb. rails laid horizontally; the back was arched the same as the other two sections, except the radius of the curve was less.

Several months have passed since these walls were concreted, but at no time have they shown the least evidence of the effect of the swelling ground, and there is no sign whatever of weakness in any part of the chamber. The difference between concreting and the best-known methods of mine timbering, in this instance, is the difference between success and failure. Had timber been used, there would have been no end to the cost of upkeep; as it is, the upkeep will be *nil*. Had this station been timbered, it would always have been damp, dark and cold; as it is, the temperature is just right, the walls are perfectly dry, the floors are cemented and all on the same level, the walls are whitewashed, so are the chutes and headframe, and the whole is well lighted with electric lamps; there are no dark corners and it is easy to keep it clean.

Along the tunnel and up to the shaft chutes for a distance of 160 ft., there are three tracks, and beyond the chutes there is enough track to accommodate 20 cars, which is about the size of the trains pulled by the three-ton motors. These tracks are fitted with automatic

switches so that the motorman does not have to get off the motor when he changes from the front to the rear end of the train. The chutes hold about 75 tons and are fitted with the Brunton arc chute doors. In front of the chutes there is considerable space that has been taken advantage of, by making it into a repair shop for drills and cars, equipped with a drill press, emery wheel, work bench, pipe-cutting tools and vises. Along the double tracks just mentioned are a blacksmith shop, carpenter shop and a change room for the miners, this last connected with the compressor room from which the warm air passes.

The blacksmith shop, about 100 ft. from the shaft, is cemented throughout. It was not the intention to do heavy blacksmith work in this shop, but for tools it is just the thing. It is equipped with a Leyner drill sharpener and a Case oil-burning forge, using a Utah 34 gravity oil, costing 8c. per gal. in small lots.

Compressor-Room Equipment

The installation in the compressor room consists of two Sullivan air compressors of the two-stage angle type: One 18x11x14 machine rated at 147 hp., capacity 704 cu.-ft. per min., at 8,000 ft. belt driven by a synchronous motor-generator set; the other a 20x11x14 machine, capacity 873 cu.ft. per min. to 100 lb., at 8,000 ft., is direct-connected to a synchronous motor, type T. R. E. 32 poles, 225 r.p.m., 2,200 volts. These two compressors are to furnish air to run the shaft pumps and drills while sinking is going on. The sinking pumps will only be required to throw water from the bottom of the shaft to cement tanks that will be constructed every 200 ft. in the shaft. At each tank will be stationed a Jeanesville two-stage 600-gal. pump working against a head of 250 ft. At the 600 level will be placed a four-stage 750-gal. pump capable of working against a head of 600 ft.

In addition, in the compressor room, there is the belted exciter rated at 7.5 kw., 125 volts, for the larger compressor which has the usual amortisseur winding for starting. The switchboard for this machine is very simple, consisting of a single panel. The motor-driven exciter set is also in this room, and it is equipped with a standard type of starting compensator with automatic overload and low voltage protection, and is also equipped with a TD regulator for automatically maintaining constant voltage.

Engine-Room Equipment

The hoisting engine is a double-reel first-motion electric hoist built by the Wellman-Seaver-Morgan Co. The control is fine, the cages can be moved, in case of necessity, much slower than with a steam engine. The motor is 400 hp., and has ample power in reserve. The brakes and clutches are fitted with air cylinders which get their supply from a small 5-hp., G. E. direct-connected motor-driven two-cylinder 1,200 r.p.m. compressor.

The cables for the hoist are the flat-rope type, ½x4½ in., 1,600 ft. long. On the end of each rope is a 52-cu.ft. capacity skip, designed by me and built at our own shops. As these skips are too large for quick loading in the bottom of the shaft, provision was made for hanging a large bucket under them. These buckets are dumped into the chute pockets that are constructed for the different levels, and the ore hoisted at any time to the pockets at the shaft collar. The skips are provided with valves in the bottom, so that water can be bailed when necessary, and this has enabled the saving of the pumps more than once.

In front of the main hoist is a 10x12 double-cylinder single-drum hoist for handling the pumps, etc.

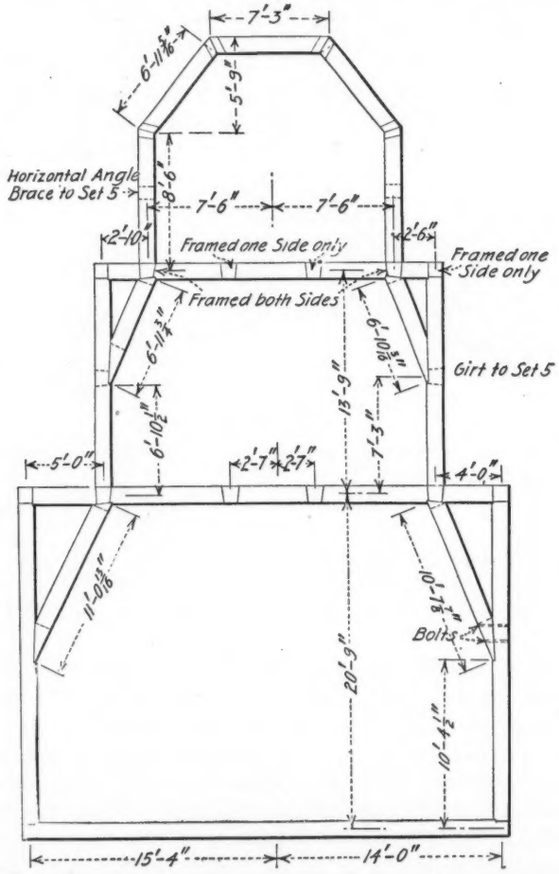
The Electrical Equipment

The electrical equipment for the control of the hoist consists of the following:

One direct-current generator driven at constant speed by the synchronous motor. Field windings consist of a regular commutating pole winding and three sets of windings on the main poles. The three sets of windings comprise a reverse series field of four turns per pole; a separately excited field giving a maximum of 5,000 ampere-turns at 125 volts; and a shunt field giving a maximum of 5,500 ampere-turns at 600 volts.

One direct-current motor direct-connected to the drum shaft of the hoist. Field windings consist of a regular commutating pole series winding, and a separately excited field on the main poles.

One drum-type controller and rheostat for controlling and reversing the separately excited field winding of the



TIMBER FRAMING FOR SILVER HILL UNDERGROUND HOISTING STATION

direct-current generator and by this means controlling and reversing the generator voltage, and hence controlling and reversing the speed of the hoist motor.

One rheostat (B) in series with the separately excited field of the direct-current generator for the purpose of making permanent adjustments of the control.

One rheostat (C) connected in series with the 600-volt shunt field winding of the direct-current generator for the purpose of making permanent adjustments in the control.

One hand-operated cutout switch for cutting out the 600-volt shunt field winding of the direct-current generator when it is required to operate the hoist at reduced speed (for repairs, examinations, etc.).

Two safety-limit switches for the purpose of automatically stopping the hoist at the top and bottom of the shaft.

One ammeter with zero at the center of the scale, for indicating the current to the hoist-motor armature and thus indicating the torque of the motor.

One voltmeter with zero at the center of the scale, for indicating the voltage across the hoist-motor armature and thus indicating the speed (and direction) of rotation of the hoist motor.

This control equipment is a modification of the standard Ward Leonard variable voltage control, the essential difference between the two being that in the standard system each notch of the controller corresponds to a certain definite speed (forward or reverse), whereas in the modified system each notch of the controller corresponds to a certain definite torque (forward or reverse).

In the operation of this system at starting, the controller can be moved instantly from zero to maximum position, resulting in maximum torque in the hoist motor. When it is required to stop the hoist, the controller may be brought back instantly to the zero position, corresponding to approximately zero torque.

The equipment is as fool-proof as a standard Ward Leonard control with mechanical limit on the controller, and by reason of the elimination of this mechanical retarding gear on the controller drum, the operation is easier and more flexible. In its characteristics it closely resembles the control of a steam or air hoist, with the advantage that the single controller handle performs all the operations corresponding to regulation of the throttle and the reversing valve gear of a steam or air hoist.

CONSTRUCTION AND EQUIPMENT COSTS

Excavations, including the engine and compressor foundations 144,900 cu.ft. at $0.09 (labor only)		$13,041.00
Framing and placing timber		3,150.00
Tramming 14,400 cars (18 cu.ft. capacity) by electric motors to portal of tunnel, 9,000 ft. at $0.0812 per car		1,169.28
Tramming 2,872 cars of sand from mill to station 10,000 ft. at $0.09. Cost per cu.yd. concrete	$0.15	258.48
Placing forms. Cost per cu.yd. concrete	.9573	1,650.00
Bending reinforcing steel	.1085	187.00
Power, concrete mixer, crusher, small hoist	.4266	735.00
Placing concrete and crushing rock	6.7656	11,657.19
Cement	3.9621	6,826.76
10% loss in timber and plank for forms, etc	.2386	411.12
Reinforcing steel bought	.6828	1,176.59
	$13.2918	
Tunnel haulage, by electric motors, timber-machinery, reinforcing material, headframe, men and all other supplies		3,252.24
Transferring machinery from wagons to mine trucks, unloading same at station and placing the heaviest pieces in position and laying 9,000 ft. of electric cable		3,618.00
Railway and wagon freight		2,056.72
Lighting		293.17
Explosives		934.78
Timber for skip pockets, etc		456.00
Iron and steel for skips, chute bottoms, bolts, etc		585.82
Electrical consulting engineers		1,000.00
Shop labor, building skips, erecting machinery, installing electrical apparatus, headframe, etc		4,291.32
		46,750.47
Electrical machines, compressors and hoists		57,320.00
Total cost of underground station built and equipped		$104,070.47

In order to provide for slow-speed operation of the hoist, a cutout switch is connected in the 600-volt field circuit, and when this is cut out the equipment operates in the same way as a standard Ward Leonard control, each notch of the controller representing a certain definite speed, except that the whole range of the controller covers speeds from zero up to about one-third speed.

The portion of the electrical equipment that is on the operating platform of the hoist consists of the controller which, as aforesaid, regulates the torque of the hoist motor; a large illuminated dial ammeter reading both ways, which indicates the amount and direction of the torque; a large illuminated dial voltmeter reading both ways, which indicates the direction and speed of rotation of the hoist; and a small cutout switch as described, for use when running at slow speeds, for stretching rope, examining shaft, etc. The total cost of the underground station is given in the accompanying table.

I wish to express my thanks to Lenord Wilson, electrical engineer, and to J. B. Ambler, electrical expert for the General Electric Co., for their help in the preparation of the electrical data in this article. In the construction of the station Merrian Longmire, who was foreman in charge, should be commended. The work was done with credit to himself and profit to the company, and in all the dangerous work not a man was hurt.

Lead-Smelting Projects in the Coeur d'Alene

The following interesting article, slightly condensed, that appeared in the circular of Norman & Muxen, of Spokane, Sept. 20, 1915, shows how the smelting situation in the Cœur d'Alene is viewed by some eyes.

Since last month evidence has accumulated to support our analysis of the smelting situation as it affects the Cœur d'Alene district. There is now no doubt that the American Smelting and Refining Co. has so manipulated matters as to assure to itself practically undisputed sway in the district. Combination with its erstwhile rivals has killed competition, and when outside contracts expire, as they will within the next 18 months, the entire district will pass under the domination of the most unscrupulous and rapacious combination that has ever squeezed life out of legitimate business. As we see it, indications now point to a defensive and offensive alliance with American Metal Co., the last rival.

To understand the situation it is necessary to go back a little. Ohio & Colorado Smelting Co. is controlled by the American Metal Co. and the latter controls the product of the great Interstate-Callahan lead-zinc mine. Lead ores of Tamarack & Custer, controlled by the Day family, are also under contract to Ohio & Colorado, but, since Hercules closed down in May last, its ores have been forwarded to the East Helena plant of the "trust," under an amicable arrangement between the two smelting companies. Tamarack & Custer is now connected with the rehabilitation of the old Le Roi smelter, at Northport, Wash.

Some weeks ago it was rumored that the sharp drop in price of lead was due to a severe fight between the two big selling agencies, which had previously entered into a "gentlemen's agreement" to divide the European demand. However, it was not surprising when announcement was made that the "trust" had declined to divide up a big British order with the American Metal Co. Then price-slashing was commenced, and meanwhile the supposed rivals made more secure their hold upon the producer. Peace has doubtless settled down over the frenzied belligerents, and both are laughing in their sleeves at the easy conquests they have made.

A little later occurred the trouble between stockholders of Interstate-Callahan, and again is seen the light-fingered touch of the "trust" and its latest satellite. Eugene R. Day, president and general manager of Hercules, brother of Harry L. Day, president and general manager of Federal Mining and Smelting Co. (controlled by the "trust") and of Jerome J. Day, president and general manager of Tamarack & Custer Consolidated, has been named receiver by the Shoshone County courts while litigation affecting smelting contracts with American Metal Co. is in progress. It all makes a nice, compact little family party.

Harry L. Day, brother-in-law of Edward Boyce, former president of the Western Federation of Miners, multi-millionaire of Hercules making, still remains as manager of Federal. The alignment therefore seems to indicate a combination of American Metal-Guggenheim-Days against Bunker Hill & Sullivan. International Smelting Co., a subsidiary of Anaconda, which made such a drive after lead-smelting business three years ago, has lain down with the metallic lion like a

good little lamb. There is no possibility of real competition in that direction, nor from United States Smelting Co., and contracts now in effect will doubtless be dropped as they expire. This will throw Marsh and Hecla into the maw of the combination within two years.

Further, we believe that James Hill, the railroad magnate, has joined the combination with attractive freight rates and that the stage is set for a "ring-around-the-rosy" dance, with the lead production of the Cœur d'Alenes in the center and American Metal, Jim Hill, Daniel, Simon, Isaac and lesser Guggenheims, Harry L., Eugene R. and Jerome J. Day as the coryphees. It will be an all-star bill, but expensive entertainment for the Cœur d'Alene producer. Before the whirl is over we expect to see Tamarack & Custer taken in by the "trust" through Federal and an effort made to mulct the fool American public once more with this moth-eaten, disreputable and dry-squeezed stock.

The third paragraph of the foregoing strikes us as betraying imperfect information about the lead market, and there may be some misconceptions in other paragraphs, but the essay is entertaining, even if it be inaccurate.

Interstate-Callahan Fight

WALLACE CORRESPONDENCE

The fight for control of the Consolidated Interstate-Callahan company, which was precipitated at Duluth a few months ago and resulted in the election of two boards of directors, will now be transferred to the Federal court for the district of Idaho. When the Interstate and Callahan companies were consolidated several years ago, each received 170,000 shares in the new company. Those to the Interstate were distributed among the stockholders of the original company, but those to the Callahan have been held intact, the latter company still maintaining its corporate existence. Of this amount about 70,000 shares are owned by James F. Callahan, and his friends own enough to make more than a majority. Therefore they control the Callahan company. An effort was made in the district court here to force a distribution of this stock, but it failed, the court holding that it was a matter of which the directors had control. At the recent annual meeting in Duluth, what is known as the Callahan-Boutin faction attempted to vote this stock, which, with other shares friendly to them, would have given the control. The Robbers-Percival crowd, which is in actual possession of the affairs of the company, refused to permit the Callahan stock to be voted and proceeded to elect directors and officers. The Callahan-Boutin faction thereupon withdrew and also elected directors and officers.

The next move for control was made in this city a few weeks ago, when the Callahan Mining Co., Joseph Boutin and others filed complaint against the Consolidated Interstate-Callahan Mining Co., as represented by the officers elected by the Callahan-Boutin faction, and asked for the appointment of a receiver to take charge of the company's property and handle its business until such time as the question as to which set of officers was legally elected is settled by competent authority. Judge Woods, of the state court, granted the petition and appointed Eugene R. Day, manager of the Hercules mine, receiver. It was then, for the first time, that the Robbers-Percival faction, at the New York office, heard what was doing. The receiver had filed a bond of $300,000 and was about to take possession of the mine, when an appeal was made to Judge Woods to stop further proceedings until the Robbers-Percival crowd could be heard. This was granted, and a few days later a question of jurisdiction was raised and Judge Woods was asked to grant time for an appeal to the United States court for the district of Idaho. This was granted, and the appellants were also required to file a bond for $300,000 as a guarantee against damages on account of the receiver's not taking charge. The Consolidated Interstate-Callahan Mining Co. is an Arizona corporation and none of its officers are residents of Idaho. The case was submitted to Judge Deitrich, of the Federal court, who a few days ago rendered his decision granting the petition to transfer the case to the United States court. In his opinion Judge Deitrich admitted that the case involved many perplexities and that he would, if desired, hear further argument upon motion to remand, and this will doubtless be the next move of the Callahan-Boutin attorneys. The attorneys for the Robbers-Percival faction will no doubt move to have the entire proceedings dismissed and at the same time endeavor to bring the question of the Callahan stock to an issue in the Federal court, in the hope of securing an order for its distribution to the individual stockholders.

The case is one of absorbing interest here, and outside of the many interesting points involved that appear in the court record, the opinion is advanced in some quarters that the appointment of a receiver would eventually be followed by a readjustment of large interests, which might mean the obliteration of the Interstate-Callahan in the process of effecting a consolidation upon even a greater scale.

The Wisconsin Zinc District--III

In the article on the Wisconsin Zinc District—III, in the *Journal* of Sept. 4, 1915, p. 387, an error occurred

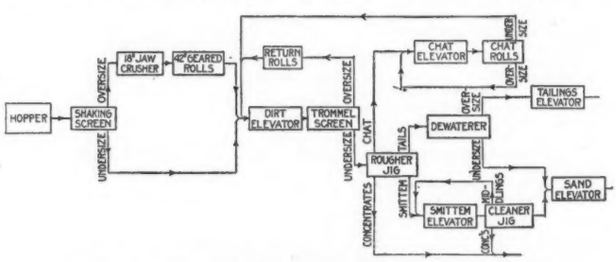


FIG. 32. FLOW SHEET OF ZINC TREATMENT

through which an entirely foreign illustration appeared as Fig. 32. The drawing shown herewith is the flow sheet which should have been shown.

Victoria Mineral Output, 1914

The mineral output of Victoria during 1914, according to the Secretary for Mines, was valued at £2,086,183, a decrease of £85,294 from the preceding year. The gold produced (413,218 oz.) was valued at £1,755,236. Other items, in descending order of value were: Coal, 617,536 long tons; antimony ore, 7,603; tin ore, 53; diatomaceous earth, 1,000; silver, 13,460 oz.; gypsum, 1,077 long tons; kaolin, 808; brown coal, 2,715; manganese ore, 20; magnesite, 23 long tons.

The Potential Waterpower of the Pacific Coast is given by J. W. Beckman at 11,504,000 hp. (San Francisco meeting, American Electrochemical Society). Of this Washington has 4,932,000 hp.; Oregon, 3,148,000 hp.; California, 3,424,000 hp. The amount developed is said to be: Washington, 306,000 hp.; Oregon, 105,000 hp.; California, 430,000 hp.

Geology of Tintic Ore Deposits*

SYNOPSIS—Early mining done about equally in igneous and limestone formations. Since 1913 all production has come from limestone in northern section of district. Monzonite, the youngest of the igneous rocks, considered the mineralizing source of all important Tintic orebodies. There are three types of ore deposits—limestone-igneous contact, limestone replacement, and igneous deposits.

The first geological report on the Tintic district to be issued was that by Tower and Smith, published in 1899, in the form of a paper in Part III of the *Nineteenth Annual Report of the United States Geological Survey,* and also as *Folio No. 65, Geologic Atlas of the United States.* About four years ago a second investigation was begun by Waldemar Lindgren and G. F. Loughlin, of the United States Geological Survey. With the exception of a paper on the oxidized zinc ores of the Tintic district by Mr. Loughlin, the results of their work are still unpublished.

Situation, Topography and History

The Tintic district lies about 65 mi. due south of Salt Lake City and on the west central slope of the Tintic Mountains, a short range which forms the connecting link between the Oquirrh Mountains on the north and the Cañon Range on the south—the group constituting the first of the Basin ranges to the west of the Wasatch Mountains.

The productive portion of the district embraces an area about 6 mi. long and 2 mi. wide, which is divided between Juab and Utah Counties. Within this area are the towns of Eureka, Mammoth, Robinson, Silver City and Knightsville.

As in most of the Basin ranges, topographic relief is strong, dropping rapidly from peaks of 8,100 ft. above sea level to elevations of 5,600 ft. in Tintic Valley on the west and 4,500 ft. in Goshen Valley on the east.

Tintic is among the oldest mining camps in Utah, being antedated only by Bingham, Rush Valley and Little Cottonwood. Ore was first discovered in the monzonite about 1 mi. east of Silver City in December, 1869, and the district was organized in the following spring. The first claim recorded was the Sunbeam, located Dec. 13, 1869, on the first discovery. This was followed in quick succession by locations in the limestone; first on the Mammoth ledge near the middle of the district, and shortly after on the Eureka Hill ledge near its northern end.

Mining operations began at once with the construction of two mills and as many smelteries during the first 12 months. Once located, the orebodies have been found to be fairly persistent.

During the early days of the district the production was about equally divided between the deposits in the igneous rocks at the south end of the district and those in the limestone at the north end. But upon the exhaustion of the oxidized ores in the igneous rocks, due to high water level, the balance of production was shifted to the deposits in the limestone; and since the closing of the Swansea mines at Silver City in 1913, the entire production has been from the latter deposits. The total production of the district to Jan. 1, 1914, was $143,398,119.

Areal Geology of the District

The rocks of the Tintic district consist of Paleozoic sediments and a variety of igneous rocks of Tertiary age.

The sedimentary rocks consist mainly of quartzite and limestone having a total thickness of 12,000 ft. or more. For economic and lithologic reasons they have been subdivided in descending section as follows:

Humbug sandstone Humbug limestone	Constituting the Humbug formation of the United States Geological Survey.
Tetro limestone Carbonaceous shale Blue Fossiliferous limestone Chief Consolidated limestone Gemini limestone	Constituting the Godiva limestone of the United States Geological Survey
White-lime-shale Centennial limestone Golden Ray limestone	Constituting the Eureka limestone of the United States Geological Survey.
Tintic slate Tintic quartzite	Constituting the Tintic or Robinson quartzite of the United States Geological Survey.

At the top of the section is the Humbug sandstone, on the east slope of the Godiva Mountain. This is 224 ft. thick, and is not known to be ore bearing.

The Humbug limestone, 378 ft. thick, consists mainly of nearly pure, coarse-grained gray limestone with a few intercalated beds of arenaceous limestone of yellowish buff color. This formation is well exposed on the upper east slope of Godiva Mountain and has carried most of the ore in the Godiva-Sioux Mountain and Iron Blossom ore zones.

The Tetro limestone, 355 ft. thick, consists with little variation of hard, fine-grained, blue cherty limestone which is not known to be ore bearing.

The Carbonaceous shale, 160 ft. thick, is essentially a thinly bedded, black shaly limestone, containing bands of black chert, and weathering to a platy or shelly surface. It is most unpromising as an ore-bearing medium and is nowhere known to be mineralized.

The Blue Fossiliferous limestone, 542 ft. thick, consists of 300 ft. of blue cherty limestone in beds from 1 to 3 ft. thick, resting upon 242 ft. of blue, highly fossiliferous limestone in thin beds separated by thin partings of impervious clay shale. This formation has been quite extensively prospected, and found to carry no orebodies of importance.

The Chief Consolidated limestone, 615 ft. thick, consists of a series of contrasted horizons which in descending order, have the following characteristics:

- 80 ft. of very coarse-grained, massive dolomitic limestone, on the whole quite favorable to mineralization.
- 64 ft. of fine-grained, siliceous, hard, brittle, black limestone, which is generally barren, though running the entire length of the ore-zone in the Chief Consolidated mine.
- 38 ft. of medium-grained, fairly pure, blue limestone in thin beds, but with a few black shaly partings, which appear to offer some resistance to mineralization.
- 31 ft. of coarse-grained, pure, white to light-gray limestone, which appears to be especially favorable to mineralization.
- 120 ft. blue, flaky and fairly pure limestone, which also appears to be especially favorable to mineralization.
- 72 ft. of coarse, mottled, light-gray, massive dolomitic limestone, readily susceptible to mineralization.
- 212 ft. of fine-grained, ashy-gray impure limestone with 14 or more intercalated thin beds of quartzitic sandstone.

*Abstract of paper to be presented by Guy W. Crane, Eureka, Utah, at meeting of American Institute of Mining Engineers, February, 1916.

The horizon lies to the west of the ore zone proper, and its character is such as to discourage exploration for ore within its limits.

The Gemini limestone, 902 ft. thick, consists of 45 or more relatively thin alternating horizons of blue, gray, light-gray and white limestone of varying texture and hardness, but all generally distinctly bedded. The formation is especially characterized by its purity, that is, lack of siliceous members, and general susceptibility to mineralization.

The White-lime shale, 920 ft. thick, consists throughout of fine-grained, bluish-gray, thinly bedded shaly limestone with a few thin conglomeratic beds of the interformational type. It is generally extensively sheeted where folded and weathers to a yellowish white, whence its name. It is characteristically unfavorable to mineralization and is not known to be ore bearing.

The Centennial limestone, 798 ft. thick, consists of four relatively thick horizons of massive dark-blue limestone interspaced by as many relatively thin horizons of thinly bedded light-gray limestone and one 6-ft. member of thinly laminated light-green shale. Except for the shale and two 20-ft. impure sandy horizons, the entire formation is apparently favorable to mineralization.

The Golden Ray limestone, thickness 1,559 ft., consists of five thick horizons of heavily bedded dark-blue to bluish-gray dolomitic limestone interspaced by five relatively thin horizons of fine-grained light-gray to white, thinly laminated impure limestone. While this formation is not known to be ore bearing, a large part of it possesses characteristics that are apparently favorable to ore deposition in other ore-bearing horizons.

The Tintic slate, thickness 358 ft., consists essentially of thinly laminated green slate with intercalated bands of impure, gray banded limestone near the top and thin bands of brown quartzitic slate near the bottom. The formation is highly sheeted, due to folding. Its siliceous and wholly barren nature does not invite exploration.

The Tintic quartzite, the lowest member in the stratigraphic series, is not fully exposed, but has an estimated thickness of 5,000 to 7,000 ft. It is for the most part a pure, compact, fine-grained quartzite, white to pink in color. Bedding is indistinct and readily confused with a pronounced sheeting due to folding. Occasional interspaced thin beds of pebble-quartz-conglomerate break the general massive nature and lend a clue to the structure.

The Igneous Members

The igneous rocks consist of rhyolite, andesite, tuff and breccia, and monozite, all of Tertiary age.

The Packard rhyolite, locally referred to as porphyry, occurs as surface flows and intrusive dikes. It occupies a large area in the northern end of the district and, underlying the town of Eureka, extends to the north and east in a range of hills of which Packard's Peak is the most prominent. Its thickness at this point probably exceeds 1,000 ft. The rhyolite varies in color from pink and light purple to light and dark gray. In texture it ranges from glassy to highly granular, with flow banding as a common characteristic.

No metalliferous deposits are known to occur with the Packard rhyolite. Its chief economic interest lies in the numerous springs issuing from the lower slopes, from which the entire water-supply of Eureka and the mines in that section of the district is obtained.

Large areas of andesite with associated tuff and breccia lie to the east and south of the productive portion of the Tintic district. They are for the most part older than the metalliferous deposits and have no genetic relation to the latter.

The Sunbeam monzonite is confined to the southern half of the district, where it forms the country rock over an area 4 mi. in length, north and south, and 2 mi. wide. It is the youngest of the igneous rocks and occurs in the form of an intrusive stock, cutting and enveloping fragments of all the earlier formations. On the north it lies in an irregular but nearly vertical contact with the limestones, which it has metamorphosed through a zone varying from 300 to 500 ft. in width. On the east and south it is in irregular contact with the andesite. Its western boundary is obscured by the overlapping, alluvium-filled valleys, Ruby Hollow and Diamond Gulch, which show it to have been deeply eroded.

In color it is light to dark gray, usually with greenish-brown tinge. In texture it is normally evenly granular, but varies from porphyritic on its east and west boundaries to granitic where it is in vertical contact with the limestones.

What is known as the Swansea rhyolite is probably a rhyolitic phase of the monzonite and belongs to the same period of intrusion. The monzonite is a formation of first importance, since it has been the mineralizing source of all the important orebodies in the Tintic district.

Structure Mainly Synclinal

The sedimentary formations are folded into a simple and fairly symmetrical overturned syncline, the major axis of which strikes north and south and pitches slightly to the north. The axial plane of the fold dips about 60° to the west, resulting in vertical and often overturned dips in the beds of the east limb of the syncline, while the angles of the dip of the beds in the east limb are correspondingly low, rarely exceeding 40°. By reason of its pitch, the syncline becomes wider to the north where the trough is folded into a series of crenelations, forming a wide synclinorium. South of the Ajax fault, which extends from the Mammoth mine east to the Iron Blossom No. 3 mine, no synclinal structure is obtained. While the beds on the north of the fault are steeply inclined, conforming to the normal structure of the syncline, those on the south are relatively flat, lying with gentle dips to the east, in which direction no return dips are observable, because of a thick covering of volcanic rocks.

The folding of the sediments was accompanied by extensive faulting, fracturing, fissuring and sheeting. The major faults are of the transverse type, striking in a nearly east-west direction across the line of the major fold. These faults show lateral displacements ranging from 500 to 3,000 ft. The direction of throw is usually to the east on the south. Connecting the major faults at various angles are numerous minor faults showing displacements ranging up to 200 ft. Rotary faulting is common, as is shown by marked disparity in the attitude of the beds along the plane of the faults. The major faults are usually accompanied by one or more parallel faults, inclosing a breccia or sheared zone. The occasional occurrence of breccia zones and slickensides parallel to the bedding planes must be interpreted as evidence of some faulting of this type. None of the faults are known to extend into the igneous rocks, which are evidently of later

origin. While it is probable that most of the faulting occurred during the period of folding, it is not unlikely that some faulting and fracturing accompanied the intrusion of the monzonite, though none of this origin has been recognized.

Fractures and fissures occur in both the igneous and the sedimentary rocks. Sheeting is confined to the latter.

In the Sunbeam monzonite and its porphyritic phase, the Swansea rhyolite, are numerous ore-bearing fissures which have a general north-south direction, but vary from as much as N 20° W to N 45° E. These fissures are of the stretch type, due to shrinkage accompanying the consolidation of the igneous intrusives. For this reason they do not extend into the adjacent sedimentary rocks.

The sediments during the period of their deformation were extensively fractured and sheeted, generally along shearing planes. The fractures, which are usually steeply inclined, are most numerous in the steeply dipping beds and in the vicinity of the major faults. They trend at all angles, those in the northeast and southwest quadrants being the most abundant.

Sheeting has occurred in the quartzite, slate and more impure shaly limestone beds, where these have been closely folded. It is best developed in the Tintic slate, and the White-lime-shale, along the western limb of the syncline. The Tintic quartzite also is extensively sheeted.

The Ore Deposits Are of Three Types

There are three types of ore deposits in the Tintic district: limestone-igneous contact deposits; limestone replacement deposits; and deposits in igneous rocks.

At numerous points along the contact of the limestone and the igneous rocks, particularly the Packard rhyolite, are thin deposits of iron and manganese oxide associated with more or less red and greenish jasperoid and clay-iron stone. The jasperoid has been observed to grade into the limestone of which it is a replacement. The iron-manganese deposits occur both at the contact and filling cavities in the limestone near the contact.

Deposits of this type are widely distributed over the district, particularly its northern end, where because of the resemblance of the associated jasperoids to certain phases of the quartz in the productive limestone replacement deposits, they have received considerable attention from prospectors.

Locally, small quantities of silver and gold have been reported, but except for the iron ores that have been mined intermittently for fluxing purposes, these deposits have no economic importance.

The ore deposits in the igneous rocks are confined to the southern half of the district, where they occur as veins in well-defined stretch fissures in the Sunbeam monzonite and Swansea rhyolite. The veins are as a rule nearly vertical, with frequent croppings at the surface. They have general north-south courses but vary from N 20° W to N 45° E. One, the Sunbeam, has been worked through a length of 2,000 ft. on the strike, but most of them pinched out at a distance of a few hundred feet.

As shown by the old workings, the veins vary in width from a few inches to 10 ft., usually pinching with depth. The average width is about 2 ft. The ore in its unaltered state consisted of silver-lead sulphides and sulpharsenides, occurring in bands and lenses in a gangue of quartz and pyrite. These materials constituted about three-quarters of the mass of the vein. Considerable copper occurred in some of the southern mines, while those in the north have produced lead and silver almost exclusively. Gold occurred sparingly in but few of the deposits. Ground-water level was usually encountered at a depth of from 200 to 700 ft., depending upon the proximity of the sediments. Above water level, the ores assumed the usual oxidized character, with some secondary enrichment. Below ground-water level there was marked decrease in the value and size of the orebodies. This and water troubles usually caused an early cessation of mining, and today all these properties with one or two exceptions are indefinitely abandoned. Since the closing of the Swansea mines in 1913, there has been no noteworthy production from deposits of this type.

Four Ore-Bearing Zones

The orebodies formed by replacements in limestone are confined to the northern half of the district and include all the now productive mines. Mining operations have developed four nearly parallel ore-bearing zones, within which the orebodies appear to be virtually continuous, though at intervals the connections may be mere seams of quartz. These zones have a general north-south direction and may be defined as follows:

The Eureka zone, including the Centennial Eureka mine on the south and extending through the Eureka Hill, Bullion Beck and Gemini mines to the Ridge & Valley mine on the north.

The Mammoth zone, beginning at the Black Jack mine on the south and extending through the Lower Mammoth, Phœnix, Gold Chain, Mammoth, Grand Central, Victoria, Eagle & Blue Bell mines to the Chief Consolidated mine on the north.

The Godiva-Sioux Mountain zone, beginning at the North Star mine on the south and extending through the Red Rose, Carisa, Northern Spy, Utah, Uncle Sam, Yankee, May Day and Apex mines to the Godiva mine on the north.

The Iron Blossom zone, beginning at the Dragon Consolidated mine on the south and extending through the Black Dragon, Governor, Iron Blossom Nos. 1 and 3, Sioux Consolidated, Colorado Nos. 1 and 2, and Beck Tunnel No. 1 mines to the Beck Tunnel No. 2 mine on the north.

The Eureka zone is the shortest and at its northern end is divided into two or more channels. At its southern end it appears to connect with the Mammoth zone through the Grand Central mine, in which case it is a branch of the Mammoth zone. These two zones lie on the west limb of the syncline, where the beds are nearly vertical and their orebodies have great vertical range.

The other zones are well defined throughout their length of about 2 mi. and apparently have no interconnections. They lie near the trough of the syncline, and their orebodies are correspondingly shallow.

Like replacement deposits in general, those of Tintic are very irregular in form, but in both shape and size they are governed within certain limits by the associated structures. This explains the dissimiliarity in occurrence of the orebodies in the different zones.

In the Eureka and Mammoth zones, which are in the nearly vertical beds of the west limb of the syncline, ore has been mined from the surface to the depth of 1,800 ft.; the orebodies as a rule conforming very closely to the bedding in both strike and dip.

If any one form of orebody can be said to be typical of these zones, it is that of an irregular sheet, pinching and swelling along the line of the beds and feathering upward into chimneys, or pipes.

Where the ore channel is crossed by faults or zones of fracture, there is usually an enlargement of the orebody along the line of intersection of the faulting and the bedding. This gives rise to another very common type of orebody, characteristic of the western zones, where it is usually the most largely productive form.

At the intersection of the ore channel by a fault, it is not an uncommon occurrence to find that the line of mineralization turns from the plane of the beds and follows the fault for distances up to 100 ft. or more, before again taking the usual course along the beds. Occurrences of this kind probably also account for the occasional division of a single ore channel into two or more parallel ore channels.

In the Godiva-Sioux Mountain zone, the known orebodies have smaller vertical extent but greater lateral variation than do those in either the Eureka or Mammoth zones. This is probably due to the fact that the Godiva-Sioux Mountain zone lies nearer the trough of the syncline where the beds dip at relatively lower angles, seldom exceeding 60° and sometimes as low as 15°.

In the Iron Blossom zone, particularly in its northern half, we find still greater restriction in both vertical and lateral extent of the ore than of the other ore zones. This, again, can be attributed to the controlling influence of the structure, since this portion of the zone takes a course directly in the trough of the syncline. The south half of the zone traverses beds dipping at angles up to 30°, and here the orebodies resemble more closely in form those of the Godiva-Sioux Mountain zone.

Among the several formations described, there are only four which are known to be ore bearing. These are the Centennial, Gemini, Chief Consolidated and Humbug limestones. In each case the ore-bearing formation contains several horizons of coarse, soft and relatively pure limestone, while the remaining formations are more generally fine-grained, hard and siliceous, in that they carry varying proportions of shale and sand.

The influence of magnesia in the limestone is not clearly shown. One dolomitic horizon in the Chief Consolidated formation is quite generally mineralized, while another is only sparingly so. The dolomites are usually coarse-grained—a favorable factor, which may offset the disadvantages of difference of solubility.

By reason of the folded and broken state of the limestone beds, the ground-water level is extremely low (about 4,765 ft. above sea level) in the sedimentary rocks. This puts it at depths beneath the surface of from 2,300 ft. in the higher properties to 1,500 ft. in those having shafts at relatively lower positions. This condition has led to more or less complete oxidation of the original sulphide ores, with some downward segregation of the ore minerals, and some enrichment due to shrinkage in volume.

Origin, Distribution and Character of the Ore

Very little ore has been mined below ground-water level; but developments have demonstrated its continuity into that zone, and something as to its original sulphide character. Above the water level the ore is largely oxidized.

From the earliest days an important variation in the north and south distribution of the ore minerals in the several ore zones has been noted. It appears that gold-copper ores predominate at the south end of the zones, gradually giving place to increasing proportions of silver-lead ores to the north, where the latter minerals predominate. As a result the mines in the vicinity of Mammoth have been chiefly producers of copper and gold, while those in the vicinity of Eureka are chiefly producers of silver and lead. Zinc is found associated with the ore of both ends of the district, probably more frequently in the mines at the north. Vertically the ore zones show no such striking variation in mineral content; but generally the good gold stopes are in the upper levels.

The vertical extent of an ore zone is governed primarily by the accompanying structures. The more nearly vertical are the inclosing beds, the greater the vertical range of the orebody. The presence of faults and fissures also favors greater vertical range, irrespective of the angle of the bedding. Their influence is greatest, of course, where the bedding is nearly vertical. The large orebody in the south end of the Chief Consolidated mine, which has a vertical range of 1,000 ft. or more, rakes along the inclined line of intersection of vertical beds and a large cross break.

Importance of the Monzonite

The occurrence of the Tintic deposits both within the monzonite and in the immediately adjacent limestones; the character of the mineralization, which is now generally considered to be due to the action of hot solutions; the progressive change in the mineral composition of the ore with increased distance from the monzonite—all point to this rock as the prime factor in the mineralization. In this respect the deposits of Tintic are like the many others in the southwestern part of the United States, and particularly in western Utah, which are as a rule closely connected in origin with igneous (commonly monzonite) intrusions.

The localization of the deposits within the monzonite was determined by the formation of stretch fissures within the congealing magma, which furnished channels of circulation for the hot solutions that were given off during the period of cooling.

The localization of the deposits in the limestone was controlled in part by the attitude and character of the beds and in part by the presence of fissures, some of which were probably produced during the period of monzonite intrusion.

Following the fissures caused by the intrusion, the hot mineral-bearing solutions found their way through the fractured and metamorphosed zone into the unaltered limestone, where they naturally took the easiest avenue afforded. This, in the absence of open faults and fissures, was the plane of the bedding.

Where the dip of the beds approached the vertical, the solutions found channels at various elevations, ascending or descending as conditions allowed, but laterally confined to relatively narrow limits. Flat-lying and low-pitching beds, on the other hand, have tended to confine the solutions to a more nearly horizontal course, at the same time permitting greater lateral shift.

At the intersection of faults, the solutions were allowed to spread out both vertically and laterally, producing orebodies of large size and great vertical range. The

process of mineralization has been primarily a replacement of the limestone with quartz and varying proportions of copper, lead, zinc, and silver sulphides, presumably due to decreasing temperature and pressure in the solutions as they run their northerly course.

Soft, coarse-grained, nearly pure limestones have been much more readily replaced by the solutions than the harder, fine grained, and more siliceous beds. Certain horizons of the latter type, even where directly in the course of the mineralized zone, are found to be uniformly barren.

Of the four zones so far developed, not one has been traced to a logically demonstrated terminus, and it is by no means established that similar and equally productive zones do not exist, still undiscovered, in the district.

Power to Condemn Land

By A. L. H. Street*

The right of a mining or ore-milling company to condemn land for use in its operations is recognized by the Nevada Supreme Court in the recent case of Goldfield Consolidated Milling and Transportation Co. vs. Old Sandstorm Annex Gold Mining Co., 150 Pacific Reporter, 313.

It is a well-settled principle of constitutional law that private property cannot be condemned for private use, but that, on payment of full compensation to the owner, it may be taken for "public" use. It is also well recognized by the courts that it is within the power of a legislature, acting in good faith, to determine what shall constitute "public" use. Acting under this authority, the Nevada legislature has declared that mining for valuable minerals is the paramount interest of the state, and therefore a public use. Applying this statute, the Supreme Court holds in the case above cited that the use of land as a place upon which to deposit tailings from an ore mill is a public use for which land may be condemned.

It is further decided in the same case that since it is a general rule that, when a corporation seeks to exercise the right of condemnation, its discretion in the selection of land will not be questioned by the courts if it acts in good faith and not capriciously, it is no defense to proceedings to condemn certain land that there are other tracts available for the purpose; and that an absolute necessity for taking the particular land is not necessary to authorize its condemnation.

Another point adjudicated is that the facts that the land sought to be taken in this case had been located and patented as mining ground, and that there was a possibility that it might be used in the future for mining purposes, no work having been done on it for several years, did not prevent condemnation, especially in view of the fact that the condemning company expressed willingness that the order of condemnation should provide that the owners of the ground might carry on mining operations so far as the same would not interfere with the company's operations, and especially since it is likely that the land will be freed from the tailings, for the deposit of which the land is to be used by the company, after being retreated.

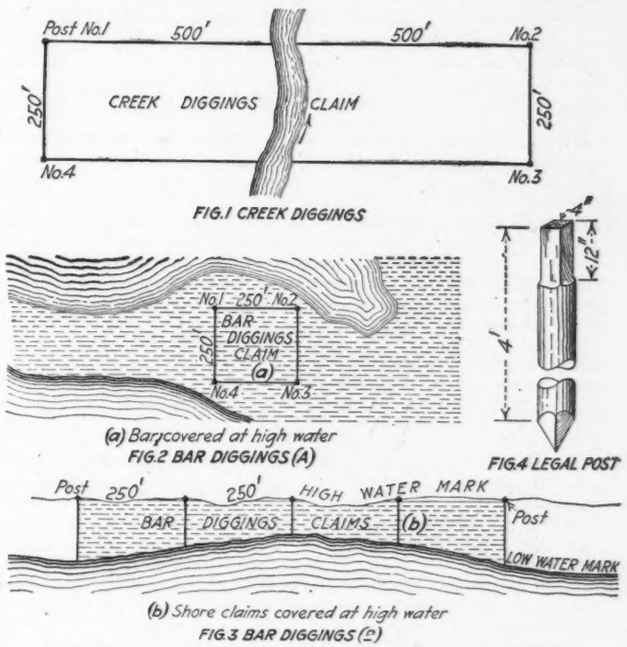
Seaweed Potash is reported to be under investigation in Monterey County, Calif., by the Hercules Powder Co. A launch is being used for gathering the seaweed or kelp, which will be shipped to San Francisco for experimenting.

*Attorney, St. Paul, Minn.

Acquiring Placer-Mining Claims in British Columbia

By J. A. Macdonald*

The rules and regulations for prospecting and laying out mining claims in British Columbia differ materially from those of the Yukon and the other provinces under federal jurisdiction. While under the Dominion regulation a miner or prospector may stake out a 500-ft. claim along a creek, in British Columbia only 250 ft. is permitted; while for "bar diggings" as well as "dry diggings," the area is limited to 250 ft. square, with important distinctions, of course. As in the other provinces, every person over 18 years of age, as well as every joint-stock company, is entitled to all the rights and privileges of a "free miner" and shall be considered a "free miner" upon taking out a free-miner's certificate, which is not transferable. This certificate, for which the



STAKING PLACER CLAIMS IN BRITISH COLUMBIA

fee is $5, runs from the date of issue to midnight on May 31 next after its date. The certificate is brief:

> This is to certify that.....of..... is entitled to all the rights and privileges of a free miner from midnight on the [date of issue] day of.....19.... until midnight on the thirty-first day of May, 19...
>
> Issued at..... on the.....day of.....19...
>
> [Signature of issuing officer.]

In case a person allows his free-miner's certificate to expire, he may, at any time within six months from the date of such expiration, obtain from the proper officer—the Gold Commissioner or the Recorder—upon payment of a fee of $15, a special-miner's certificate. Every free miner shall be entitled to locate and record only one claim on each separate creek, bar or dry diggings.

Placer-mining claims are divided into three classes, with a subclass: (1) Creek diggings, which claim shall be 250 ft. long, measured in the direction of the general course of the stream, and shall extend in width 1,000 ft., measured from the general course of the stream,

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500 ft. on either side of the center, see Fig. 1; (2) bar diggings, which shall be (a) a piece of land not exceeding 250 ft. square on any bar that is covered at high water, see Fig. 2, or (b) a strip of land 250 ft. long at high-water mark, extending in width from high-water mark to extreme low-water mark, see Fig. 3; (3) in dry diggings a claim shall be 250 ft. square, similar to bar diggings shown in Fig 2. On the discovery of a new locality, however, a free miner is entitled to a claim 600 ft. in length, or a party of two, 1,000 ft. Abandoned claims are treated as a new locality, on the discovery of a new stratum of earth containing precious metals.

"Placer mine" and "diggings" are synonymous terms and mean any natural stratum or bed of earth or gravel mined for gold or other precious metals. "Creek diggings," Fig. 1, means any mine in the bed of any stream or ravine; while "bar diggings" means any mine between high- and low-water marks on a sea, river, lake or other large body of water, as in Figs. 2 and 3. "Dry diggings" means any mine over which water never extends.

Locating and Recording Placer Claims

Every placer claim must be, as far as possible, rectangular in form and be marked at the corners by four "legal posts" firmly fixed in the ground. One of these is called the "initial post," and on this is written or attached this notice:

> Take notice that [set out name of each locator] have this day located this ground as a placer claim (or as a set of placer claims), to be known as the "..... Placer Claim" ..... feet in length. Its general direction is .....
> Dated this.....day of.....19...

On one post mark "Initial Post" and fix the notice on that post. On the notice is written: (a) The name of the locator; (b) the number of his free-miner's certificate, the date of the location and the name given to the claim.

In timbered localities all boundary lines of a placer claim must be blazed so that the posts can be distinctly seen, and the locator shall also erect "legal posts," not more than 125 ft. apart on all boundary lines. In localities where there is no timber, monuments of earth or rock may be erected, but not in the case of the legal posts marking the corners. These must be as shown in Fig. 4. Any location made on Sunday or any public holiday shall not for that reason be invalid, any law or statute to the contrary notwithstanding. The free miner on locating a placer claim must record the same in the office of the Mining Recorder for the Mining Division, within 15 days if located within 10 miles of the office, and one additional day is allowed for every 10 miles additional. The application for such record shall be under oath. Any claim not recorded within the prescribed time shall be deemed to be abandoned. A free miner, having duly located and recorded his claim, is entitled to hold the same during the existence of his record or re-record of such placer claim.

Every placer claim must be represented and worked in *bona fide* by the holder or some person in his behalf, continuously, as nearly as possible, during working hours, and is deemed abandoned and absolutely forfeited when it shall remain unworked for a period of 72 hr., except during the close season, lay-over or leave of absence, or during sickness, or for some other reasonable cause shown to the satisfaction of the Gold Commissioner. A leave of absence for one year is obtainable upon giving the Gold Commissioner satisfactory evidence that such is necessary, or upon the application for such leave being signed by all the holders of the claim or set of claims.

Every free miner "shall, during the continuance of his certificate but not longer, have the right to enter, locate, prospect and mine for gold and other precious metals upon any land in the province, whether vested in the Crown or otherwise, except upon government reservations for townsites, land occupied by any building, and any land falling within the curtilage of any dwelling house, and any orchard, and any land already lawfully occupied for placer-mining purposes, and also Indian and naval and military reservations." Previous to any entry being made upon lands already lawfully occupied, the free miner must give adequate security for any loss or damage which may be caused by such entry and shall make full compensation to the occupant or owner of such lands for any loss or damage which may be caused by reason of such entry; such compensation, in case of dispute, to be determined by a court having jurisdiction in mining disputes in British Columbia, with or without a jury.

Any free miner has liberty, at any period of the year, while actually prospecting or engaged in mining, to kill game for his own use. As a general right, every free miner is entitled to locate and record only one claim on each separate creek, bar or dry diggings, though he may hold any number of claims by purchase. In the event of a discovery of a vein or lode on his placer claim, he shall have no right to the same, unless he shall have located and recorded the ground as a mineral claim; and until he shall so locate and record such ground, as described in the Mineral Act, the same shall be open to any free miner to locate and record as a mineral claim in accordance with the provisions of that act.

A free miner, having located and recorded a claim and finding that it is of no value, may abandon it by posting notices to that effect on the four corner posts of his claim and recording such notice with the Mining Recorder, and forthwith shall thereupon be entitled to locate and record another placer claim upon other ground in lieu of the abandoned claim, and the abandoned claim shall then be open to relocation.

Leases on Occupied or Unoccupied Lands

A free miner in British Columbia is entitled, through the Gold Commissioner, to obtain a lease of any unoccupied and unreserved Crown land and even land already lawfully occupied, for placer-mining purposes for a term not exceeding 20 yr. Any free miner desiring to obtain a lease of any placer-mining ground marks out such ground by placing a legal post at each corner and by posting a notice on the post nearest to the placer claims then being worked in the immediate locality (if any), and within 30 days posts a notice in the office of the Mining Recorder, setting out: (1) The name of the applicant or of each applicant; (2) the locality of the ground to be acquired; (3) the quantity of ground; (4) the term which such lease is applied for. On making application, the free miner must deposit with the Mining Recorder a plan of the ground in triplicate and also deposit the sum of $20, which may go toward the payment of the first year's rent. Applications shall

not be greater than the following distances: In creek diggings on abandoned or unworked creeks ½ mi. in length; any other placer mining ground, 80 acres; but in no case must a lease extend along any creek or river more than 500 yd., creek diggings excepted. Leases are granted for placer mining only. A lease is not granted for any mining ground any portion of which is actually occupied by free miners, unless with the consent of such occupiers. Every lease provides for securing to the public reasonable rights-of-way and water, nor shall it prevent free miners from entering upon such ground to mine for veins or lodes.

The Gold Commissioner, with the sanction of the Lieutenant-Governor in Council, may grant a lease for any term not exceeding 20 yr. on the bed of any river below low-water mark for dredging purposes, for a distance not exceeding 5 mi. upon such terms as he shall think fit; provided always that every such lease shall reserve the right to every free miner or mining company to run tailings into such river at any point thereon, also to mine 2 ft. below the surface of the water at low-water mark, by putting in wing-dams, whether such miner shall locate before or after the date of such lease, nor shall the holder of a dredging lease interfere with free miners from constructing wing-dams into any such bars, banks or benches for the purpose of conducting mining operations, either by sluice or rocker. It is not lawful, however, for any free miner to construct wing-dams within 1,000 ft. of any dredger while working nor to obstruct any dredger in any manner.

Brazilian Monazite

Owing to the war the mineral production of Brazil is attracting more attention in the United States and Great Britain than seemed likely a short while since, says the *Mining Journal,* Oct. 2, 1915. In particular, the high price of monazite is bound to attract attention to all known deposits.

The export of monazite from Brazil is the subject of a concession to a French banker, M. Chouffour, for a period of 15 years dating from 1912. Of the profits 50% goes to the Government, in addition to a royalty rising to £120,000 when a stipulated tonnage has been shipped. According to official particulars, a stock of about 8,000 tons was held in Hamburg shortly before the war. Previous to the control acquired by the French Syndicate, the exploitation of the deposits was shared by two concessionaires, who fixed the price of thorium oxide at £5 15s. per unit.

The best-known deposits are those of Bahia, a concession over which was first granted to a Mr. Gordon in 1896. There are also important deposits in the State of Minas Geraes, more especially at Corrego da Onca, Dattas, as well as in the Casa and Jequitinhonha Rivers. A dressing plant is employed on the Parahyba River, where the sands are dressed on Wilfleys and the concentrates passed through magnetic separators to remove the iron in the sands. The raw material contains about 2% of thorium oxide, and the plant has a capacity of about 50 tons per month. Previously the cost laid down in Hamburg was put at between £15 and £20 per ton, and the value of the concentrate £28 15s. Exports in recent years have been: 1910, 5,437 tons; 1911, 3,686 tons; 1912, 3,398 tons.

Physical Control of Employees

The physical examination of employees to prevent the placing of unfit men in responsible positions has been instituted by many firms and corporations. It has always been attended with good results so far as efficiency in the work and satisfaction to the employee have been concerned; nevertheless, the practice has always been more or less opposed by the laborers themselves. In instituting the practice at the works of the Nevada Consolidated Copper Co., the authorities have taken pains to explain the reasons for doing so and the effect it will have upon employees. This explanation is so clear and reasonable that it is worth while reproducing here.

Men seeking employment, or having secured positions through the employment department, will be put to work "subject to medical examination." It will be required of every man employed to submit himself for physical examination immediately upon entering the service of the company, or during the time he is seeking employment if he so desires.

It will also be requested that employees now on the payroll shall take advantage of the opportunity to be examined. This task of examining employees will be commenced at once and will be spread over such period of time as may be necessary to its accomplishment, taking into consideration the convenience of the medical department and of employees. Employees need not worry over the result of physical inspection, nor need they borrow any thrills of terror of its "hurting" them in any way, physically or financially, in the assurance that no man now on the company payroll will suffer the loss of employment because of any ailment or physical defect; and in the further assurance that the results of individual examinations will not under any consideration be made public.

Nor will men now in the employ of the company who may take the examination be requested or required to sign any release or undertaking which will affect in any way their present hospital agreement or existing relations with the Nevada Industrial Commission.

It is intended that such examination as will be made shall be of as great, if not greater, benefit to each individual than it will be to the company. It will be practically in line with the scheme of the big life-insurance companies, which are making provision for free medical examination for their patrons and urging all their policy holders to submit to medical examination at least once a year. The object is to enable men to anticipate and ward off the approach of physical ailments, on the theory that "a stitch in time saves nine."

So far as the company is concerned, it is a safety-first proposition, a measure to promote accident prevention by trying to fit a man to a job wherein he will not be a menace to himself or to his fellow-workers. Relatively speaking, the hazards of every workman's occupation are affected by many elements of chance, human error, negligence and ignorance—but there is no reason why an employee should be subject to the further danger, the unseen, invidious menace of a fellow-employee's physical unfitness for his job. You, Mr. Miner, would not like it, would you, to risk your life daily on a cage controlled by a hoist engineer who might be subject to heart disease and who might collapse at any moment and drop you into the sump or drag you up into the sheaves. You would not like it, would you, Mr. Smelter-man, if a dinkey engineer should run amuck with his engine and a train of molten slag around the yard, endangering the lives of employees, because he could not see or was unable to determine the color of signal flags or lamps? You, Mr. Millman, would not want to work around a machine or machinery operated by a man who was not thoroughly fit physically, as well as mentally, to control that machine in case of emergency, would you? If hazards of this nature can be done away with, you would be willing to help, wouldn't you?

Many of the employing industries in this country and in Europe have required their medical departments to render this service, and not one word of protest has been made by employees, because men have come to see and understand that physical examination has largely eliminated a serious hazard in their daily work, a hazard to which they might otherwise, unknown to themselves, be subject.

Russian Nickel Deposits in the Urals, which have not heretofore been worked on account of the low grade of the ore, are now being exploited. The ore mined is being treated at the Redwinsk smelting works, which are reported to be turning out at the rate of 600 tons yearly of nickel matte.

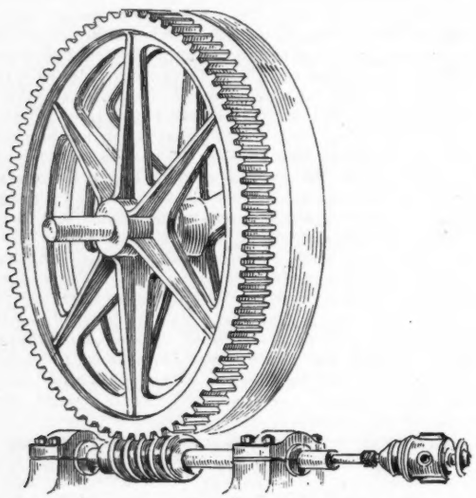
Details of Practical Mining

Facing-Off a Brake Wheel

By A. E. Hall*

The accompanying sketch shows a scheme used for surfacing off a brake wheel without dismantling the hoist to any extent. It sometimes happens that a job of this sort must be done around a mine, and usually the machinery for handling a piece of this size is not to be had, so that the wheel would have to be returned to the factory for repairs.

The brake band in the present case was lined with asbestos blocks which were bolted to the band. The blocks became worn, and the bolts cut into the brake wheel. When the brake was repaired the wheel had to be surfaced.



DEVICE FOR TURNING BAND WHEEL

There was no machine tool big enough to take the wheel for machining and besides there would have been the trouble of removing the wheel. There was no small cogwheel on hand, and the machine shop was not equipped to make one. We were, however, able to make a worm gear with teeth only about ½ in. high. The teeth on the large drive wheel are about 3 in. The small teeth on the worm prevented any binding. The whole of the tooth on the drive wheel was never engaged by the worm teeth, but only a part of the tooth. The worm was mounted on a shaft supported on two bearings, as shown, and the shaft was extended at one end and shanked to fit an air twist drill such as most mines have in their shops.

For the purpose of facing the band-wheel one of the lathes from the machine shop was moved to the power house. The whole lathe was moved, including the frame; simply taking the legs off. The frame of the lathe was secured to the base of the hoist. With this arrangement it was possible to move the lathe-tool, by its own carriage and feed screws, across the face of the slowly turning band-wheel.

The hoist was turned by means of the air drill set on the shanked shaft of the worm gear which turned the main drive wheel. This is a fairly large hoist with three drums 5 ft. in diameter. The same idea can be applied to any hoist, and by making the worm gear correctly, the hoist can be made to turn at the desired speed.

*Creighton Mine, Ontario.

Constructing a 70-Mi. Water Conduit in Alaska

The construction of a conduit comprising 21 mi. of flume, 37 mi. of open ditch, and 12 mi. of pipe was the subject of a paper recently presented by H. H. Hall before the San Francisco Association of Members of the American Society of Civil Engineers.

The conduit leads from the Ogelvie range of mountains southwesterly to the Klondike mines near Dawson City, Alaska. Its purpose is to convey 125 sec.-ft. of water, or about 80,000,000 gal. per day. The conduit was constructed under separate organizations during three seasons of about 120 days each (1907-1909). Ditch construction was used wherever possible—7 ft. wide on bottom, 1½:1 slope, and 3½ ft. deep, with a gradient of 4 to 7 ft. per mi., the greater portion being 6 ft.

The right-of-way was first cleared of trees and the moss scraped off, as fast as it thawed, with teams and slip scrapers. The latter work presented the most troublesome problem from a construction standpoint owing to the uneven thawing of the muck and the consequent miring of the horses. Thirty miles of ditch were dug with six 30-ton steam shovels, the remainder with horse scrapers. As the shovels required a working space at least 16 ft. wide, no side-sloping was done with them. Small patches of frost were removed with 40% dynamite, but the larger patches were passed over, and after thawing were taken out with scrapers.

The record performance for one shift was 410 ft. of ditch, or about 1,200 cu.yd., with an average performance of 14.7 ft., or 51 cu.yd. per working hour. The season was from Jan. 15 to Oct. 15, with work usually slow the first and last weeks. The finishing gang followed the shovels—truing the grade, sloping the banks, clearing the berms, building a path along the top of the soil bank for watchmen, and constructing turnouts and overflows alternately every half mile. Common labor was paid $4 per day and board.

Mr. Hall stated that under operation the ditch had proved satisfactory, leaks being caused usually by ice seams.

Flume construction was adopted where the side slopes exceeded 15 deg. or where the muck was over 2 ft. thick. The flume construction was of the board-and-batten type, 6x4 ft. in cross-section, and built of native lumber, made up in 16-ft. sections and set on trestle bents of hewn timber placed 8 ft. on centers. Most of the bents were carried on mudsills, laid below the black muck (about 4 ft. deep), great care being taken not to disturb the moss

blanket unnecessarily, and to replace it as quickly as possible over the backfillings in order to preserve the ground in a frozen condition.

It was attempted to found some of the bents on piles driven into earth that had previously been thawed out by means of 16-ft. miner's steam points. In this manner the moss was broken only to admit the pile. Where the depth of muck would require very deep mudsill pits, the experiment was tried of placing gravel ballast directly on top of the moss and laying the flume stringers on crossties.

According to Mr. Hall, several years' operation of this flume has shown that the pile foundation is the best. Mudsill bents show continual settlement, caused by water flowing down the posts (either from the flume or from natural drainage) and thawing out the substrata.

Pipe lines were employed for pressure sections. For pressures not exceeding 200 ft. redwood stave pipe was used; for over 200 ft. or less than 1,000 ft., standard-riveted; for over 1,000 ft., lap-welded steel pipe. One section was constructed of spiral riveted pipe with patent bolted couplings.

In operation it has been found that the wood pipe has given considerable trouble, owing to the fact that between Oct. 1 and June 1 lines are drained and not used. The sand and gravel carried by the ditch water have worn the bottom staves badly. All intakes are now provided with sand boxes. Accumulations of ice at the discharge ends have caused considerable trouble by increasing the pressure on sections of the pipe. On high-pressure lines the sediment cuts the steel rapidly, and in one instance a ¾-in. rivet was cut away in two weeks.—*Engineering News.*

Hints on Loading Drill Holes

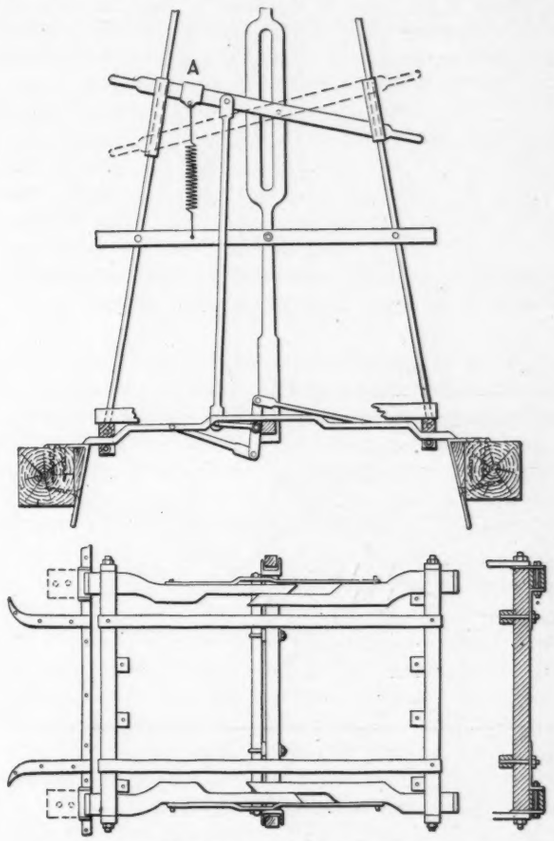
In loading short holes with a tamping stick, many blasters make a mark or notch on the stick, to indicate the distance from the collar of the hole to the top of the pocket or chamber. By this means they can tell when the pocket is loaded and when the charge begins to raise in the borehole. It is also a good idea to make a mark, or place a rubber band around the tamping stock, opposite the collar or mouth of the hole when the stick rests on the top of the charge when finished. The distance between this mark and the end of the tamping stick will give the amount of tamping in the hole so that in the event of a misfire it will be possible to remove nearly all of the tamping without danger of digging into the explosive.

The tamping stick, of whatever material, should not be a close fit in the borehole, as in loading holes full of water, where the tamping stock fits the borehole snugly, misfires have occurred, in tamping the hole, from the piston effect forcing the water into the electric blasting cap.

In loading deep well drill holes where it is not practicable to use a pole, a tamping block of hardwood attached to a rope is used. This block should not be weighted unless the holes have water in them. When weighted, a hole of about 1½ in. diam. is bored in the center of the block. A quantity of molten lead or babbitt metal is then poured in and the opening plugged with a wooden plug in such a way that no metal is exposed. These plugs are usually about an inch less in diameter than the diameter of the drill bit and from 3 to 4 ft. long. The rope for convenience and safety is passed over an open block or pulley, supported by a tripod 7 or 8 ft. high over the center of the borehole.—*Du Pont Magazine.*

Automatic Landing Chairs

An arrangement of automatic landing chairs devised by John Martin, of Taviche, Oaxaca, Mexico, which proved very satisfactory at the San Juan mine of that place, is described in the *School of Mines Quarterly.* The operation of these chairs is evident from an inspection of the sketch. A weight or spring at *A* automatically withdraws the chairs when the cage is raised and its weight taken off from them. The cage man holds the lever against the action of the weight or spring until the protruding chairs rest upon the landing and when stopping at a station, they are held in that position by the weight of the cage. The advantage claimed is that this type avoids the expense and danger of having sets of chairs at each of the levels from which hoisting is being carried on.



AUTOMATIC LANDING CHAIRS

Illuminating Powder Magazine*

The most suitable method of illuminating a magazine is by incandescent lamps with reflectors, set at some distance from the explosives. To require this, however, would work a hardship on mines that have no electric-light service. The portable electric lamp is equally safe, but is not yet sufficiently well developed to be practicable. The portable acetylene lamp is the most dangerous device

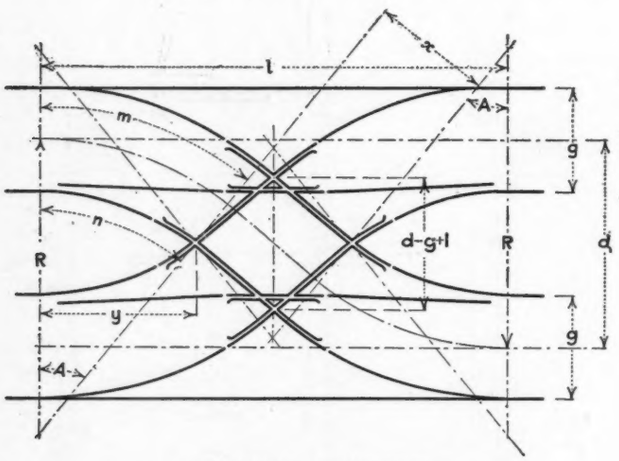
*Bulletin 75, U. S. Geological Survey.

for this purpose; the simple candle is a close second. The large acetylene lamp set some distance from the explosives is not very unsafe, but is not wholly reliable. It is strongly recommended that electric lighting be used.

Calculating Diamond Crossover for Shaft Bottom

In reply to a question as to how to put in a crossover, at the bottom of a shaft, with four frogs, *Coal Age* gives the following, the data given being the gage of the tracks (42 in.) and the distance between the two inside rails (42 in.):

The only dimensions given in this case are the gage of the track ($g = 3.5$ ft.) and the distance between track centers, which is twice the gage, or $d = 2 \times 3.5 = 7$ ft. In order that such a crossover can be operated successfully, it is necessary that the two frogs on the straight rails of the two tracks shall be constructed, as shown in the accompanying figure, with a small triangle of solid iron in the center of the frog. The purpose of this is to sufficiently separate the three points where the gage lines of the three rails cross each other. It will be sufficient if the gage lines of the two switch rails cross



A DIAMOND CROSSOVER

each other 6 in. inside of the gage line of the straight rail. This will make the distance measured straight across the rails, between the two points where the gage lines of the switch rails cross each other, $d - g + 1$, as indicated in the figure. All the dimensions in the following calculation are made to gage lines.

The first step in the solution is to find the angle A, which subtends the curved rail of each of these switches. This angle is found by substituting the values for d and g in the formula

$$\cos A = \frac{g}{d - g + 1} \times \frac{3.5}{7 - 3.5 + 1} = \frac{3.5}{4.5} = 0.7778+$$

Hence, $A = 38° 57'$.

The second step in the solution is to assume a convenient radius, say in this case $R = 10$ ft., and calculate therefrom the entire length of the crossover, from point of switch to point of switch, which is marked l in the figure. This distance is found by applying the principles of trigonometry, which gives the formula

$$l = 2 R \sin A + \frac{d - 2 R (1 - \cos A)}{\tan A}$$

Then, substituting the known values in this formula, gives for the total length of the crossover

$$l = 2 \times 10 \times 0.6286 + \frac{7 - 2 \times 10 (1 - 0.7778)}{0.8083}$$

$$= 15.73 \text{ ft.}$$

Since the angle of curvature of each of the switch rails is 38° 57′ and the radius of the outer rail in each switch is $r_1 = R + \frac{1}{2}g = 10 + \frac{1}{2}(3.5) = 11.75$ ft., the length of the outer curved rail. indicated by m in the figure, is

$$m = \frac{38° 57'}{180°} \pi r_1 = \frac{38.95}{180} (3.1416 \times 11.75) = \text{say } 8 \text{ ft.}$$

The radius of the inner curved rail is $r_2 = 10 - \frac{1}{2}(3.5) = 8.25$ ft., and the length of this inner rail, indicated by n in the figure, is therefore

$$n = \frac{38.95}{180} (3.1416 \times 8.25) = 5.6 \text{ ft.}$$

The length of straight rail in the switches, indicated by x in the figure, is found by substituting the known values in the formula

$$x = \frac{l - 2 R \sin A}{\cos A} = 15.73 - \frac{2 \times 10 \times 0.6286}{0.7778}$$

$$= 4.06 \text{ ft.}$$

The two frogs in the loaded and empty tracks respectively are located midway between the switches, or at a distance of $\frac{1}{2}l$ from either switch. It now remains to calculate the distance of the two frog-points lying between the tracks, or the distance marked y in the figure. This distance is measured on the line midway between and parallel to the two tracks, from the line joining the switches to the point of frog. This distance is calculated by substituting the known values in the formula

$$y = \sqrt{r_2 (d - g) - \tfrac{1}{4}(d - g)^2}$$

Since the radius of the inner curved rail (r_2) is 8.25 ft., the frog distance at each end of the switch is

$$y = \sqrt{8.25 (7 - 3.5) - \tfrac{1}{4}(7 - 3.5)^2} = 5.08 \text{ ft.}$$

It is possible to lengthen out this crossover by adopting a longer radius than $R = 10$ ft. The angle of curvature (A), however, remains constant, for the same values of distance between track centers (d) and track gage (g), as appears from the formula given for finding this angle. For example, for a radius $R = 15$, the length of this crossover would be $l = 19.27$ ft. It is also possible to have the crossover rails cross each other outside of the track rails instead of arranging to have them cross within these rails, as in the foregoing figure.

Blueprinting Typewritten Matter

It is often desirable to blueprint a typewritten sheet. Whether this can be accomplished satisfactorily depends on a very small kink which is not generally known. It is almost impossible to get a satisfactory blueprint from an ordinary typewritten sheet; but if, when the sheet is being written, a piece of carbon paper is put behind it so that the carbon transfers to the back of the paper, the typewritten sheet will give a perfect blueprint. This is because the impression of the typewriter ribbon is reinforced by the carbon on the back, neither one being heavy enough alone to give a satisfactory print.

Details of Milling and Smelting

Measuring Sand and Stone for Concrete Roads

Measuring sand and stone for concrete at the time it is loaded into wheelbarrows at the storage pile by the use of 2-cu.ft. measuring-boxes is called for in the specifications of the Coleman du Pont Road now being built in Delaware. The specifications are as follows:

Great stress will be laid on the method of measuring the materials used in the concrete. It will not be allowed to measure the materials in ordinary wheelbarrows unless each load is struck perfectly smooth with a straight-edge. This is to insure perfect proportions in the concrete. Contractors shall use measuring-boxes or other similar device if so ordered by the engineer.

The engineer so ordered, says *Engineering News.*

Bottomless boxes, or frames, are placed in a flat-bottomed wheelbarrow and filled with sand or stone. The

LOADING WHEELBARROW WITH CRUSHED STONE AND MEASURING LOAD AT SAME TIME

frame is then lifted up and the wheelbarrow wheeled to the mixer. In the accompanying view the boxes are being used to measure stone.

At first the contractors did not favor the boxes, but now, according to Charles Upham, chief engineer of the Coleman du Pont Road, Inc., they swear by them. A boxful does not overload the wheelbarrow.

Fluming Granulated Slag

Among the many improvements being introduced at the Washoe smeltery, Anaconda, Mont., is the handling of furnace slags by an electric railroad. Cars of 20-cu.yd. capacity will be hauled to slag dump by 40-ton Westinghouse electric locomotive using 500-volt current. The cars have one new feature—sides dropping outward in a plane with the floor of the car to form an extension that will dump material further from the track, thus preventing clogging of rails. This change became necessary as a result of the introduction of the flotation process. In the past, water from the concentrator used to granulate the slag previous to its being flumed to the slag dump, contained a great deal of slime that acted as a coating to the slag, so that water carried it a great distance over the dump. Now that slime is being re-treated, water sinks as soon as it strikes the slag pile, which, without its coat of slime, has become much more pervious and as a consequence accumulates rapidly at the discharge end of the flume. The new system of hauling is expected to solve the problem of spreading the slag over a larger area.

Tests for Screen Selection

By Fred Meinke, Jr.*

In running several old dumps through the Gold Bluff mill, at Downieville, Calif., it was found that the tailings ran unusually high. A 30-mesh screen was being used. This screen had been used in the mill before with satisfactory results, and it was also being used in the mills in the immediate vicinity. To find the cause of the high tailings, as well as the height of discharge and height of drop best suited to the ore, the following tests were made.

The screens used were No. 1, 30-mesh perforated tin, a 24-mesh No. 27 crimped-wire screen and a 27-mesh, No. 27 wire screen. Of these it was found that the 27-mesh, 27-wire screen gave the lowest values to the tailings with a decrease in tonnage which was not prohibitive.

The tests were made in a five-stamp battery of the 900-lb. type. A screen area of 6x48 in. was used. The stamps were dropped at 100 and the height of drop fixed at 7 in. The ore consisted of coarse hard quartz broken to 2 in. with very few fines. The values were mostly in free gold, so that inside as well as outside amalgamation was practiced.

In making the tests the tailings were run into a 46-gal. barrel and the time of filling noted. The water was then decanted, the pulp thoroughly dried and weighed, and the tonnage determined. Before each test the battery was run for a certain length of time in order to give the screen time to build up and the battery to get down to its normal output.

TONNAGE AND VALUE OF TAILINGS

Test No.	8-In. Discharge Tonnage	8-In. Discharge Tails	5-In. Discharge Tonnage	5-In. Discharge Tails
1 and 4—30-mesh perforated-tin screen	3.05	$1.30	3.48	$0.90
2 and 5—24-mesh crimped-wire screen	3.00	1.00	3.34	.40
3 and 6—27-mesh crimped-wire screen	2.90	.80	2.97	.20

The first three tests—Nos. 1, 2 and 3—were made with an 8-in. discharge and gave an average value of $1 for the tailings. In making the next three tests—Nos. 4, 5 and 6—the discharge was lowered 3 in., making it 5 in. With this set of tests the tailings averaged 50c., a saving of 50c. over the first tests.

*Mining engineer, Downieville, Calif.

Comparing the individual tests, it is seen that the tonnage varied but little with the different screens and the high discharge, there being only 0.1 ton per stamp difference between the 24- and 27-mesh screens. This is easily accounted for by the sizing tests, which showed 75% of the pulp passing through 80-mesh. This indicates that the size of opening or character of screen had but little to do with the size to which the ore was crushed. The particles, when fine enough, are simply held in suspension by the water and are carried out through the screen openings.

With the 5-in. discharge there was a marked splash against the screen and, as the tonnage shows, there was a greater amount put through with the coarser screens. There was an increase of 0.37 ton per stamp between the 24- and the 27-mesh screens.

SCREEN SIZING TESTS

	With 8-In. Discharge			With 5-In. Discharge		
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Screens	%	%	%	%	%	%
Through 100.....	49.2	51.0	51.7	42.9	38.4	50.9
On 100.....	24.0	26.3	26.0	23.4	24.6	26.9
On 80.....	5.7	5.4	5.5	4.9	10.7	6.29
On 60.....	4.9	6.0	4.5	6.0	6.7	6.9
On 50.....	7.9	7.5	6.8	14.5	10.9	6.74
On 40.....	8.3	3.8	5.5	8.3	8.7	2.3

Tests Nos. 1 and 4, 30-mesh perforated-tin screen. Tests Nos. 2 and 5, 24-mesh crimped-wire screen. Tests Nos. 3 and 6, 27-mesh crimped-wire screen.

The sizing tests were made to find out if the loss in values was not on account of excessive sliming due to the high discharge. Although there is no marked difference between the percentages of pulp that passed the 100-mesh with the high and low discharge, these assays showed a greater value with the high than they did with the low discharge, thus proving that the increase of slimes was causing the loss. The fine particles of gold go off in the water without coming in contact with the mercury inside the battery or the amalgam on the plates.

Another test was made to show the increase in tonnage with an increase in the height of drop of the stamps. The battery running with an 8-in. discharge and a 6-in. drop produced 2.66 tons per stamp. With the same screen and discharge, but with a 7-in. drop, an increase of 1 in., the battery produced 3.05 tons per stamp, or an increase of 0.39 ton per stamp in 24 hours.

Some Data on the Burning of Powdered Fuel

In the *General Electric Review* for October, 1915, Arthur S. Mann gives some notes on the use of powdered coal. A hot stream of coal and air driven at high speed against a wall will cut it out—a low-fusing-point brick is melted down, a refractory brick is cut away mechanically. He has cut away carborundum brick by misdirecting a fire that did not approach the melting temperature of the brick, but such action is unnecessary. The remedy is to avoid high velocity along the brickwork. If a wall must take the full force of the current, protect it with loose brick or pass the current of combustion air along its face, which will deflect and protect. An arch can always be treated in this way. Some of the combustion air is cut off from the burner and sent along on top and over it. The total volume of air used is not increased, and a reducing fire can still be carried; heat distribution is noticeably good.

The design and building of the furnaces is an undertaking that calls for a high class of engineering skill. Feed, volume and current must all be considered. Sizes and areas influence the generation and distribution of the heat. The position of egress ports, if many, may defeat the purpose of the furnace. It does not do to build a furnace in the haphazard way of "apply a burner somewhere, and if it does not work, put in enough fuel to make it work." There is probably no other fuel so sensitive to correct use as is coal dust.

Some fuels can be burned without care on the part of an operator. Gas is one and oil virtually another. There is no economy in such ways, but the furnace is undeniably hot. Powdered fuel may run all day with no change in adjustment, but the fire should be looked at every half-hour or so. Slag and some fine ash are always forming, and it is well to know where these are going. On the other hand, a wrong adjustment of either coal or air makes itself apparent. Powdered coal burns best with 200 cu.ft. of air per pound of fuel. It can burn and burn clearly with 160 cu.ft. and even less, but the extra air pays. As the supply exceeds 200 cu.ft., efficiency begins to fall. There is even a noticeable loss at 208. The eye cannot discriminate between a 200-ft. and a 208-ft. fire, but it can recognize the 250-ft. or even a 220-ft. blaze. There is a marked change in appearance and unless a cutting fire is really wanted, there is no excuse for such bad mixture. The powdered-coal fire begins to snort and wheeze when it has too much air.

Cementing Out Copper on Copper-Nickel Matte

In a recent patent (U. S. pat. 1,128,313) of N. V. Hybinette of Christiansand, Norway, assignor by mesne assignments to the National Trust Co., Ltd., of Toronto, Canada, it is stated that copper can be cemented out of copper-nickel solutions on an anode of copper-nickel alloy containing 4 to 8% of sulphur, providing that the anode has been previously corroded in an electrolytic bath. Where an anode has not been corroded previously, this is at present an impossibility. It furnishes a convenient method of depleting a copper-nickel solution of copper while simultaneously enriching it with nickel, by the use of a purely chemical reaction.

The anode itself and its production by blast-furnace smelting are covered by Mr. Hybinette's U. S. pat. 1,128,316.

Baggaley Method to Neutralize Smeltery Fumes

Ralph Baggaley has been granted a patent (U. S. pat. 1,135,488) for neutralizing smeltery fumes and preventing the escape of dust resulting from the treatment of sulphide ores by cooling the fumes to below 300° F., bringing them in contact with ore or other value-bearing material and passing the gases through a neutralizing bath. One method of carrying out the process is to deliver the fumes into a body of neutralizing material such as a bath of milk of lime. It is also proposed to cool the gases by passing them through a multiplicity of cooling flues. This idea may be applied to the gases and fumes from converters by passing them through moving bodies of ore and in contact with fresh ore material to preheat them, depositing thereon the metallic particles and heat contained in the fumes, and then passing the gases to a neutralizing bath.

Correspondence and Discussion

Civilian Engineers and Military Service

The recent editorial[1] on "Civilian Engineers and Military Service" contains valuable observations that deserve earnest consideration by engineers generally. Indeed, it is to be regretted that the proposition of enlisting the civilian engineers into an army reserve corps could not have been broached a few months earlier, so that a greater number of engineers could have been induced to attend the Plattsburg training camps of last summer. Under the circumstances, the Plattsburg movement was not sufficiently advertised in engineering circles and the attendance of engineers at the camps was noticeably small in comparison with that of other professions. In the first two battalions of the "business men's regiment," with a combined strength of 1,200 men, during the August-September encampment, probably less than 1% were engineers of any branch, while physicians, lawyers, bankers and brokers were present in great numbers. Even diplomats were almost as numerous as engineers.

It is to be hoped that other, similar training camps in the future may attract a greater attendance by engineers, even by those who may not be prepared to identify themselves with a permanent army reserve corps.

While the mining engineer, as you have pointed out, in a war emergency may prove useful to the army authorities because of his familiarity with matters of organization and administration and experience in handling large bodies of men, still in these very matters the army can give the engineer, and particularly the younger engineer, a valuable object lesson that may prove useful to him in his own peace-time pursuits. Apart from the "rudiments of military training," there was much to observe and learn at Plattsburg that was useful, both to engineer and ordinary citizen, in everyday life. The modern methods of camp sanitation and the instructions in hygiene and personal cleanliness of the soldier were highly interesting and alone well worth the time expended and the hardships endured. The system now used by the army for construction and care of camp kitchens, eating houses and latrines, with disposal of waste, etc., may well be adopted in many mining camps. Similarly also, the provision for general typhoid inoculation. The clean, airy, screened eating houses at Plattsburg, seating 125 men each, would have proved a revelation to some boarding-house bosses and proprietors of Chinese restaurants or other fly-infested eating places in our Southwestern mining camps.

During the nine days' maneuvers, when several regiments of the regular army, of all arms, participated with the "business men" in a combined force of over 4,000 men, with some 2,000 horses and mules, highly instructive demonstrations were furnished daily in the remarkably rapid and orderly manner of occupying and evacuating bivouac camps. The length of the column, with wagon train, was such that it required one hour's time to pass a given point, while on the march. But within less than half an hour of the arrival of the last detachments on the new camp site, the vast fields were occupied by the streets and abodes of an orderly community of more numerous inhabitants than even the neighboring towns; tents were raised in their allotted places, arms and equipment put away, wagons unloaded, horses and mules picketed and, best of all, company kitchens ready for business. Even more impressive was the early morning sight of the tented city disappearing, within less than one hour's time after the order to strike had been issued, leaving on the stubble of the field not a scrap of paper, nor a vestige of human, animal or kitchen waste.

These maneuvers also furnished an excellent demonstration of the value of motor trucks and motor cycles in warfare and on a larger scale than any previous army maneuver in this country. The motor trucks were used for a number of special purposes such as for searchlights, radio apparatus, machine guns, field hospital and ambulance and water wagon, but the 2-ton Autocar trucks that were used to transport the commissary supplies and company baggage of the "business men's regiment" were decidedly popular with the latter organization. These cars went wherever the mule wagons could go—on sandy hill roads, over fields and ditches, boulders and hummocks—and they made two or more trips for each trip of the mule wagons over the same distance. Sometimes, when a bridge would break down, a preceding truck would pull the other out of the hole and the succeeding ones turn into the creek, leaving the bridge to be repaired in a substantial manner by the following engineer train.

Of great interest, also, were the daily evening lectures on military subjects by officers of the regular army, each a specialist in his particular field. On one of these occasions the regiment had the pleasure of listening to an address by President H. S. Drinker of Lehigh University, who represents the A. I. M. E., on the "Joint Committee of the National Engineering Societies on the National Reserve Corps of Engineers" and also the Associated Student Societies now working to spread the propaganda of the Plattsburg idea.

OLOF WENSTROM.

Boston, Oct. 20, 1915.

[1] "Engineering and Mining Journal," Sept. 11, 1915.

Why Not Call Things by Their Right Names?

In reading the article on "Calamine Mines of Sardinia," by Charges W. Wright, published in the *Journal* of Oct. 16, 1915, I was somewhat surprised to run onto the sentence, "The term calamine is applied to the ore, though technically it is essentially smithsonite." Inasmuch as the ore is "essentially smithsonite," would it not have been much better to have so designated it in the title of the paper? This would have avoided the chance of a misconception of the nature of the zinc ore in the mines described and would have made the title much more satisfactory to the bibliographer. I am aware that some good writers use the terms *calamine* and *smithsonite* interchangeably,

probably following the custom of the miners, but for the sake of clearness such usage should be avoided.

Nashville, Tenn., Oct. 21, 1915. A. H. PURDUE.

[Professor Purdue raises an old question, namely, as to the correct definition of the oxidized minerals of zinc. In spite of the pronouncement of the United States Geological Survey to the contrary and the testimony of the government expert witnesses in the calamine tariff litigation, the term calamine has been used commercially and metallurgically for more than 100 years to include both the carbonates and both the silicates of zinc, and it was so used before mineralogists had made any distinction among these minerals. Mr. Wright, who is a mining and metallurgical engineer, apparently described the Sardinian ore from the professional viewpoint. Among zinc miners and smelters there would not be the least misunderstanding of what he meant. There are times, however, when the absence of a precise name for certain of these minerals is troublesome. What the mineralogists ought to do, we think, is to get together, talk the thing over, discard calamine as the name of a mineral species and formulate definite names for the hydrous silicate and the anhydrous carbonate. There is not any misunderstanding about willemite (the anhydrous silicate) or hydrozinkite (the hydrous carbonate). If mineralogists should agree to call the anhydrous carbonate smithsonite and the hydrous silicate hemimorphite—using Dana's second name—confusion would disappear.—Editor.]

Newfoundland's Mineral Resources

In an article by P. B. McDonald on "Newfoundland's Mineral Resources" in the *Journal* of Oct. 23, I find the statement that there are "12 seams of ore (iron) interstratified with shales and sandstones." This refers to the Wabana beds of iron ore on and adjacent to Bell Island, Conception Bay.

There are three chief beds of iron ore that outcrop on Bell Island and exist under the adjacent ocean floor. In addition to these three are a few others, of much less moment, that may be classed as parts of the three, separated from them by shale partings of greater or less thicknesses, or as entirely separate and distinct beds that may reach the dignity of minable seams in places yet to be discovered. It is difficult to classify these thinner seams, but all of them appear to be parts of certain definite ferruginous strata, the main development of each of these strata being one or the other of the three chief beds before mentioned. It would seem, therefore, that the minor seams are but portions of the chief beds. Each ferruginous stratum is separated from the other by considerable thicknesses of shales and sandstones devoid of iron.

The lowest of the three beds is that which is called the "Dominion"; above it lies the "Scotia" bed, and above that the "Upper" bed. The first outcrops along Bell Island for a length of about four miles and has a thickness varying from 4 to 14 ft. and an average of 10 ft. of clean ore. The Scotia bed outcrops for about two miles and has an average thickness of about 7 ft. Still higher is the upper bed, and its outcrop is about a mile. It is of varying thicknesses and, where now mined, runs from 4 to 8 ft. At the breast of the Nova Scotia company's submarine slope, 7,500 ft. out at sea, the Dominion bed shows in places a thickness of 28 and 30 ft., almost without shale partings, and this immense thickness forms a most impressive sight.

Mr. McDonald quotes the colonial geologist as estimating a total of three billion tons for the amount of this iron ore of Conception Bay and Bell Island. I notice that some estimates, notably that of E. C. Eckel, are much higher. The geologic work of Hayes and VanIngen, however, seems to indicate the probable tonnage to be somewhat less than either of the mentioned estimates, and I have considered that there is not far from two billion tons in the Dominion and Scotia beds. But whether there are two thousand million or five thousand million tons in this deposit is of little economic interest to the present generation. The deposits are of the utmost importance and of great moment in the consideration of the future of the Atlantic-coast iron trade.

DWIGHT E. WOODBRIDGE.

Duluth, Minn., Oct. 29, 1915.

NEW PATENTS

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALLOYS—Improvements in the Manufacture of Steel Alloys. Soc. Anon, des Acieries et Forges de Firming, Firming (Loire), France. (Brit. No. 3,427 of 1915.)

ALUMINUM—Process of Treating Aluminum Screenings, Dross, Slags, or Analogous Aluminous Materials. James Wright Lawrie, Aurora, Ill. (U. S. No. 1,156,606; Oct. 12, 1915.)

AMALGAMATOR. Erastus B. Bennett, Denver, Colo. (U. S. No. 1,157,836; Oct. 26, 1915.)

CHROMIUM OXIDE—Manufacture of Chromium Oxide. Albert Edward Gessler, Clifton, N. Y. (U. S. No. 1,158,379; Oct. 26, 1915.)

CHROMIUM SALTS—Producing Chromium Salts. Johann Heinrich Boner, Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin & Soda Fabrik, Ludwigshafen-on-the-Rhine, Germany. (U. S. No. 1,157,668; Oct. 26, 1915.)

CRUSHING—Ore-Grinding Machine. Charles O. Michaelsen, Omaha, Neb. (U. S. No. 1,158,259; Oct. 26, 1915.)

DRILL—Percussive Drill. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,154,921; Sept. 28, 1915.)

DRILLS—A Débris-Removing Device for Percussive Rock Drills. G. Mairet, London, England. (Brit. No. 24,109 of 1914.)

DRILLS—Improvements in Power-Driven Rock Drills. M. Kellow, Penrhyndeudraeth, N. Wales. (Brit. No. 13,067 of 1914 and 11,564 of 1915.)

ELECTRIC FURNACE. Ernesto Stassano, Turin, Italy. (U. S. No. 1,157,819; Oct. 26, 1915.)

ELECTRIC FURNACE. Sigmund Guggenheim, Berlin-Wilmersdorf, Germany. (U. S. No. 1,157,691; Oct. 26, 1915.)

FILTERING APPARATUS. David J. Kelly, Salt Lake City, Utah, assignor to Kelly Filter Press Co., Salt Lake City, Utah. (U. S. No. 1,158,056; Oct. 26, 1915.)

FILTERING PROCESS. David J. Kelly, Salt Lake City, Utah, assignor to Kelly Filter Press Co., Salt Lake City, Utah. (U. S. No. 1,158,055; Oct. 26, 1915.)

FIREPROOF UTENSILS—Process for the Manufacture of Fireproof Utensils from Refractory Oxides. Hans Arnold, Charlottenburg, Germany, assignor to the Firm of Dr. O. Knöfler & Co., Plotzensee, near Berlin, Germany. (U. S. No. 1,157,662; Oct. 26, 1915.)

FLOTATION—Apparatus for Concentrating Minerals by Flotation. George C. Stone, New York, N. Y., assignor to The New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,156,041; Oct. 5, 1915.)

FLOTATION—Improvements in or Relating to the Separation of Metallic Sulphide Ores. Minerals Separation and de Bavays Processes Australia Prop., Ltd., Melbourne, Australia. (Brit. Nos. 19,373 of 1914 and 19,374 of 1914.)

FLOTATION—Separation of Metallic Sulphides from Ores. Thomas Mackellar Owen, Sydney, N. S. W., assignor to Edward William Culver, Sydney, N. S. W. (U. S. No. 1,157,176; Oct. 19, 1915.)

HYDRAULIC NOZZLE. William A. Doble, San Francisco, Calif., assignor to Pelton Water Wheel Co., San Francisco, Calif. (U. S. No. 1,157,853; Oct. 26, 1915.)

INGOT MOLD. Harry E. Sheldon, Pittsburgh, Penn. (U. S. No. 1,158,318; Oct. 26, 1915.)

IRON-ORE TREATMENT — Process of Extracting Iron from Its Ores. Herbert Haas, San Francisco, Calif. (U. S. No. 1,156,775; Oct. 12, 1915.)

August Foreign Trade in Metals

Advance reports from the Department of Commerce give imports and exports of the principal metals in the United States during the month of August, which are of special interest at the present time.

Imports and exports of copper in August were as follows, copper in pounds, ore in tons:

	Imports		Exports	
	Tons	Contents	Tons	Contents
Ore and concentrates	50,511	10,890,762	7,274	272,218
Matte, etc.	1,877	954,439	....	.....
Unrefined in bars, etc.	....	18,225,578	....	.....
Refined bars, plates, etc.	....	439,050	....	37,240,920
Old and scrap	....	592,569	....	7,364
Total		31,102,398		37,520,502

The wire included in the total exports was 2,907,110. In addition to the exports above manufactures of copper valued at $794,069—quantities not given—were exported.

Imports of lead into the United States in August in all forms are reported by the Department of Commerce as follows, ore in tons, bullion and lead in pounds:

Lead ore, tons:	Ore	Lead, Lb.
Canada	107	103,000
Mexico	5,883	1,089,071
Peru	464	289,331
Total	6,454	1,481,402
Lead bullion, lb.:		
Mexico	8,643,080	8,439,972
Peru	20,385	19,376
Total	8,663,465	8,459,348
Lead, pigs, bars and old		15,820
Total lead imported		9,956,570

The total imports reported up to the end of July were 59,312,137 lb., making the total for the eight months ended with August 69,268,707 lb., or 34,634 short tons.

Imports and exports of zinc in all forms are reported by the Department of Commerce for August, as below; ore in tons, zinc in pounds:

Imports:	Ore, Tons	Contents, Lb.
Zinc ore, Canada	813	724,400
Zinc ore, Mexico	6,277	4,207,503
Zinc ore, Australia	524	587,412
Total	7,614	5,519,315
Blocks, pigs, etc.		116,675
Total		5,635,990
Zinc dust		85,657
Exports:		
Pigs, bars, etc.		2,820,728
Plates and sheets		12,568,422
Total metal		15,389,150
Zinc dust		43,550
Zinc dross		732,785

The exports of zinc dust were all reëxports of foreign material. In addition to the exports given manufactures of zinc valued at $499,214 were exported.

Japanese Mine Output, First Half of 1915

The mineral production of Japan in June, 1915, was: Gold, 646.402 kg.; silver, 13,225.353 kg.; copper, 5,757.884 metric tons; iron, 3,999.841; coal, 1,413,838; sulphur, 6,051.507 metric tons; petroleum, 47,925,720 liters.

The total production for the first half of 1915 is given by the *Japan Advertiser* as follows: Gold, 3,728.413 kg., an increase of 19.9% over 1914; silver, 72,826.696 kg., an increase of 3.3%; copper, 32,716.382 metric tons, an increase of 4.5%; iron, 23,958.758 metric tons, a decrease of 28.8%; coal, 9,093,917 metric tons, a decrease of 9.1%; sulphur, 28,522.199 metric tons, a decrease of 6.1%; and petroleum, 227,295,910 liters, an increase of 18.6% over 1914.

Elm Orlu-Butte & Superior Apex Suit at Butte

BUTTE CORRESPONDENCE

The ore controversy between the Elm Orlu Mining Co. and the Butte & Superior Copper Co., which was on trial the past week in the Federal court in Butte, Judge George M. Bourquin presiding, involves an orebody variously estimated by the experts for the Clark (Elm Orlu) and the Butte & Superior interests at $15,000,000 to $20,000,000. It is stated that if Clark wins he will get practically all of the Butte & Superior vein and orebody lying west of the Blackrock shaft, which contains enough ore to keep the Butte & Superior mine and mill running at their present capacity for a year and a half.

The Clark contention is that the big Rainbow lode has its apex in the Elm Orlu claim, which lies south of the Blackrock and Jersey Blue of the Butte & Superior Co., and that on its strike to the east it forks, the northern branch entering the south side line of the Blackrock and passing through the claim and out of the north side line, thus giving to the Butte & Superior no extralateral rights to that vein. The main contention, however, is that the Rainbow vein, on its depth, dips north into the Jersey Blue and Blackrock claims and that the Butte & Superior has been mining on the Rainbow, or Elm Orlu vein, on its dip to the north, and that between 700 and 800 ft. of that vein under the Blackrock surface belongs to the Elm Orlu. The claim of the Butte & Superior, of course, is that it owns the apex of the veins upon which it is mining, known as the Jersey Blue and Blackrock veins.

Many of the most noted geologists and mining experts of the country and learned and experienced mining lawyers appeared in the case for one side or the other. In the complaint only a nominal sum is mentioned as the value of the ore already mined from the disputed vein, but should Clark get a judgment there will follow an action for accounting. By mutual agreement the Butte & Superior has stopped mining in the ground in controversy. Beside the disputed vein the Butte & Superior has other good ore deposits and is developing more.

Iron-Mining Fatalities Reduced Two-Thirds

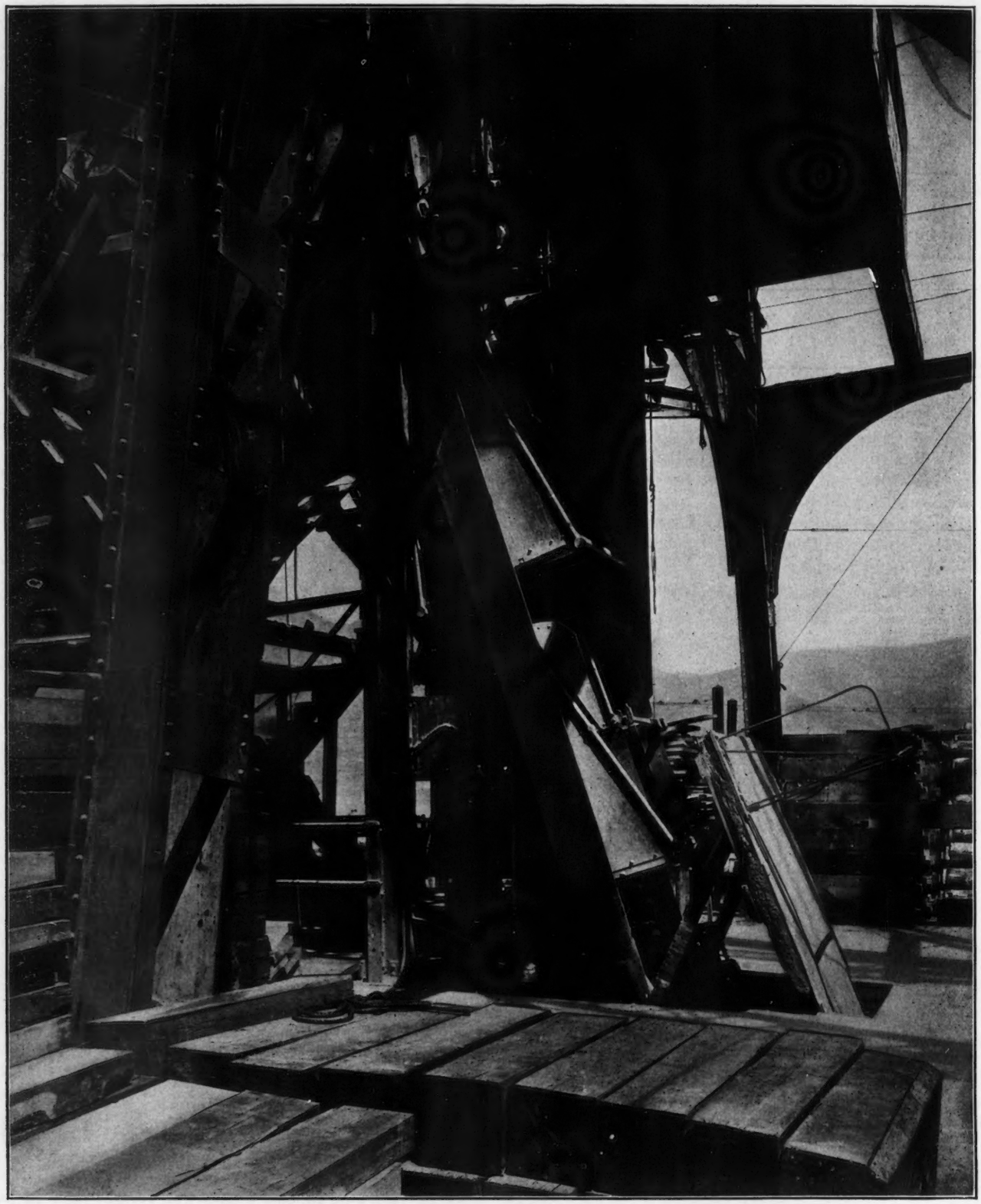
The annual report of the mining inspector of St. Louis County, Minnesota, containing the major portions of the Mesabi and Vermilion Ranges has just been filed. It shows that 830,469 tons of iron ore was mined and shipped for each fatal accident.

The following tabulation is taken from the report and indicates the success of the "safety-first" movement inaugurated several years ago:

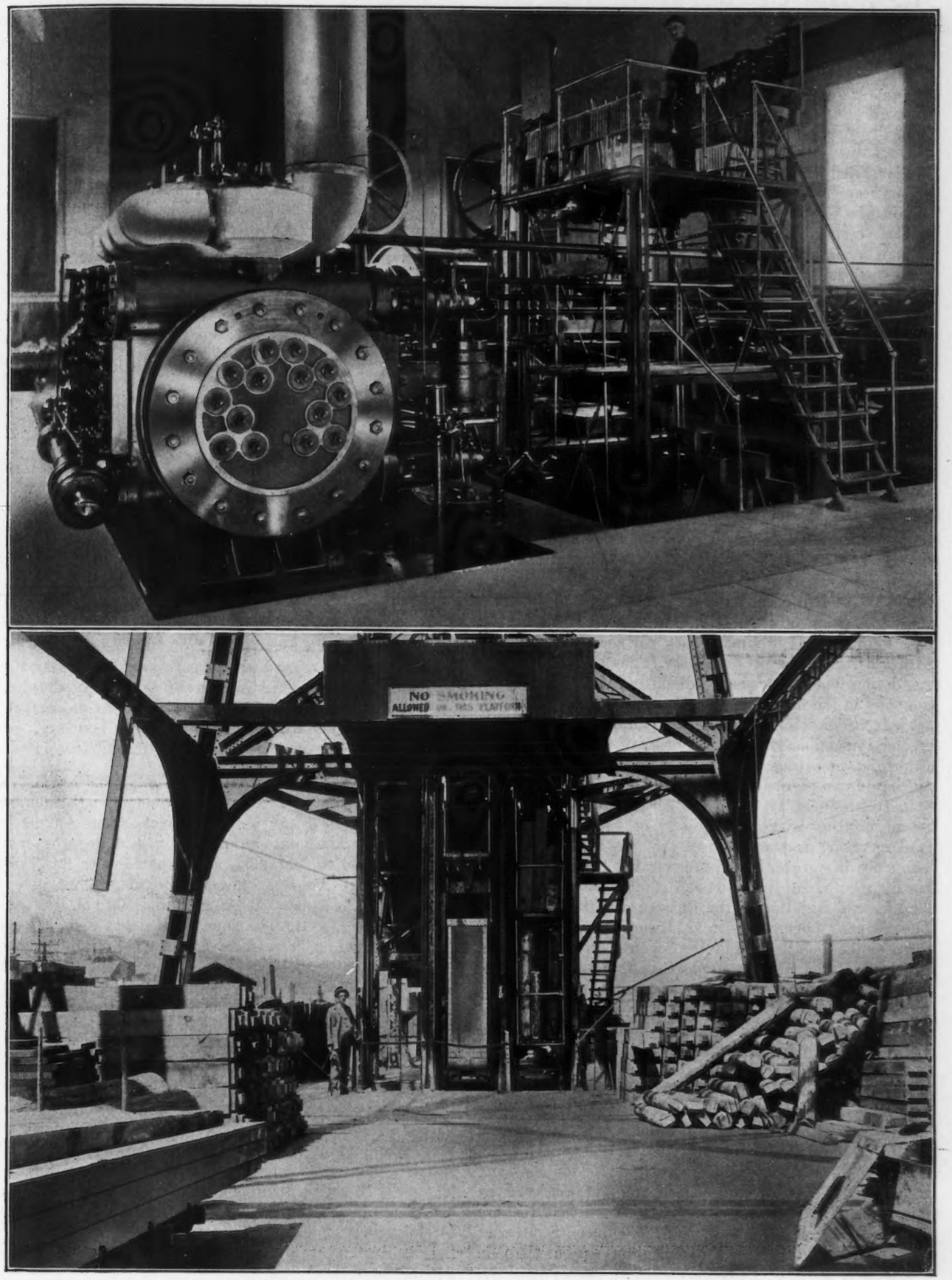
Year Ended June 30	No. Employed	No. of Killed	Fatalities per 1,000
1906	12,838	96	7.48
1907	15,535	81	5.21
1908	13,313	54	4.05
1909	13,306	61	4.56
1910	17,613	71	3.32
1911	19,981	78	2.95
1912	15,398	51	3.31
1913	16,048	44	2.75
1914	16,600	43	2.59
1915	11,436	24	2.09

Of the 11,436 men employed, 5,830 were in underground mining, 1,910 in openpit mining, 1,722 in stripping and 1,974 on surface work. The average wage paid miners was $2.96 per day.

Photographs from the Field



HIGHLY DEVELOPED HOISTING METHODS AND APPARATUS AT BUTTE, MONT.
Illustration shows the cage- and skip-changing device of a modern hoisting plant



HIGHLY DEVELOPED HOISTING METHODS AND APPARATUS AT BUTTE, MONT.

Upper view shows a typical compressed-air hoist. The lower view is of the 5-ton skip and cage at the Tramway mine, Butte

Kyshtim Corporation and the Effect of the War

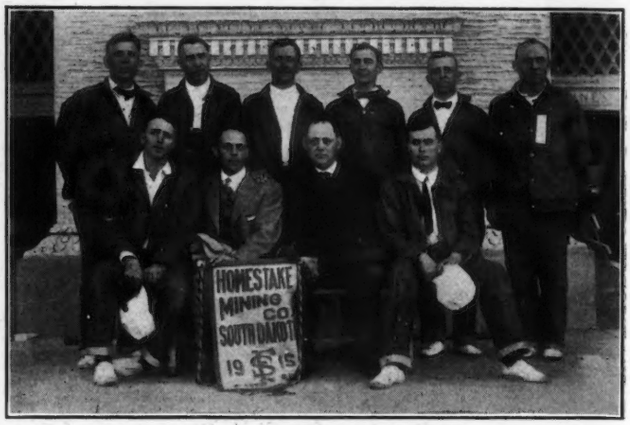
The profits of the Kyshtim Corporation last year showed a decline as the result of conditions arising out of the war. The company, however, now seems in a position to recoup these losses by reason of the stimulation of the demand for certain of its products. At the sixth annual meeting held in London recently, Chairman C. F. H. Leslie stated that the company's mines and plants in Russia were now in a position to produce under normal conditions 10,000 tons of copper per year. The war created certain new situations affecting the company and its operations. The company is erecting, at the request of the Russian Government, works for the annual production of about 8,000 tons of sulphuric acid. The cost of erecting this plant will be advanced by the Russian Government, and the first two years' output purchased at a price that is regarded as satisfactory. The company has also received orders from the Russian Government for pyrites, and has increased its output of this mineral to about 1,000 tons a week. From one-third to one-half of the employees have joined the colors, but notwithstanding this fact, the production of copper this year up to Oct. 2 was approximately 6,000 tons.

In 1914 the abnormal conditions increased the cost of producing copper by about £6 per ton. The profits on copper operations, according to the *Financial Times*, showed a decrease for the year of £67,000; from iron operations a decrease of £32,000; from forests a decrease of £3,500, and from barren pyrites a decrease of £2,500—a total decrease of £105,000. The net earnings for the year were were approximately 3s. per share as compared with 5s. during the previous year. The dividend recommendation was 1s. per share. Remittances to the English company in the form of gold and silver residues, the product of the electrolytic refinery in Russia, have finally become impossible owing to the order of the Russian Government prohibiting the export of gold-bearing residues. As there is no plant in Russia suitable for separating the refinery products, the directors of the Russian company are negotiating with the Ministry of Finance in Petrograd in regard to a solution of this problem. Nevertheless, since the beginning of the war the British company has distributed in dividends £250,000 without impairing the financial situation of the Russian operating company. The company's operations in 1914 were considerably hampered by the mobilization by the government of more than one-third of the regular employees of the company, the shortage of railway and other transport, and the commandeering of coal supplies. On account of the last circumstance, the company exercised an option on a coalfield it had been investigating. This is about 2½ miles from the railroad and is estimated to contain several million tons of coal above the 200-ft. level. Connections have been made with the railroad, and it is expected that in a few weeks this colliery will be able to supply all the coal required by the company.

During the 12 months ended April, 1915, the company extracted 352,000 tons of copper ore, but disclosed by development and drilling 558,000 tons, so that the ore reserves in April, 1915, were 2,667,000 tons. Since that date a new borehole at the Smirnoff mine has cut the lode at a vertical depth of 1,100 ft., or 500 ft. deeper than the previous depth proved at this mine. The east vein of massive pyrite was 6 ft. in width, and the west vein for 41 ft. contained nearly 3% copper and about 10s. per ton in precious metals. It was considered that this borehole had indicated an additional two years' life to the mine, or a total of approximately 10 years of ore reserves at the present rate of production.

Homestake Mine-Rescue Teams

At the third national field meet, held Sept. 22-24, at the San Francisco exposition, an interesting set of contests between mine-rescue and first-aid teams was held. There were 26 first-aid teams and 15 mine-rescue teams competing. Probably the most interesting of them all was the team representing the Homestake Mining Co., of South Dakota. This team won first place in the first-aid contest and fourth place in the mine-rescue competition. A photograph of the team is shown here.



HOMESTAKE FIRST-AID AND MINE-RESCUE TEAMS

Reading from left to right, top row: A. E. Aldalo, J. F. Peters, J. Letcher, B. Hardwick, M. Ellis, Wm. Yeager. Bottom row: C. L. Ayer, captain, First-Aid team; R. W. Bonney, manager, Mine-Rescue team; Dr. F. E. Clough, manager, First-Aid team; C. A. Brooks, captain, Mine-Rescue team

California Oil in September

The California production of petroleum in September amounted to 7,370,430 bbl., a decrease from August of 300,000 bbl. The total shipments for 30 days in September, amounted to 7,778,807, as compared with 8,077,586 for 31 days in August. The amount of oil shut in was 18,000 bbl., the same as in August, and 500 bbl. less than in September, 1914. The amount of stocks Sept. 30 was 59,624,905 bbl., a decrease of 537,372 bbl. from August. This reduction in field stocks was insufficient to have an appreciable effect on the general situation, but it confirms the opinion of oil-trade experts that stocks of crude petroleum in pipe lines and field storage were being drawn upon to the extent of approximately 20,000 bbl. per day in September, because of the excess of shipments over production.

Field reports show that 30 new wells, with an initial output of about 10,000 bbl. per day, were completed in September; 17 of these wells are in the Midway-Sunset district. This is an increase of 18 new wells over August. The wells in active drilling in September numbered 145, a decrease of 7 from August. Drilling activity was due to obligations of leases. There were 6,438 wells producing in September, a total average daily production of 245,681 barrels.

Schedule of prices paid at the wells for crude petroleum remained the same as in the last four months.

Editorials

Revival of the Mining Industry

Unless all signs are fallacious, the mining industry of the United States is experiencing a real revival. This is not to say that it has been inactive or sick, for there has been scarcely a year during the last decade when there has not been an increase in the production of iron, copper, lead and zinc; but ever since 1907 there has been a sluggishness in gold and silver mining, an absence of interest in the development of new mines and an alarming decline in prospecting. Moreover, the troubles in Mexico during the last three or four years brought mining in that country to a standstill, seriously affecting the interests of American investors and manufacturers, engineers and operators.

Several things have combined to bring about a new and favorable turn in the mining industry. In the first place the huge demand—and consequent high prices—for copper, lead, zinc, antimony and quicksilver, due to the war, greatly stimulated the mining of those metals and required the services of a good many more men and the addition of a good deal of new machinery. Take the case of zinc smelting, for example. A very large sum has been invested in new plants since the beginning of 1915.

Similarly the extraordinary prices commanded by some of the rare ores, such as tungsten and molybdenum, sent hundreds of prospectors into the field to look for them. With tungsten ore selling at $2,000 and upward per ton, the discovery of a deposit yielding a carload or two is enough to give the lucky prospector a fortune. The *Journal* has heard of a case where samples from Mexico were exhibited to an adventurer in Arizona. He recognized them as wolframite and organized an expedition to go into the inferno of bandits and revolutionists to get some of it. His man came back with a cargo of 30 tons that sold for $75,000. Prizes like that inflame the prospector of '15 as nuggets of gold did the fortyniners. Not one out of a hundred, or a thousand, will be so lucky in tungsten, but some of the 99 or 999 are likely to stumble upon some previously unknown deposits of the other metals that may eventually develop into producing mines.

Other favorable conditions are developing, especially the reawakening of the spirit of speculation among the American people and the hopefulness as to restoration of law and order in Mexico.

The *Journal* has repeatedly expressed the opinion that there would be no general revival in the development of prospects and small mines, participation in the business by the thousands instead of by the few, until there had been a prolonged and successful bull movement in Wall Street. The great exploration companies and firms seldom develop mines. They are looking for sure things—huge deposits of ore developed by somebody else, too low in grade to be worked by any little concern, which they can make profitable by the use of immense capital and the application of professional skill. Such operations create but little semblance of activity in mining. What gives the tone is when hundreds of little companies are gambling in all directions upon the finding of ore. Ordinarily it is hard to find persons to go in for such gambling. Clergymen and widows are prone to it, but those classes alone are unable to keep the game going. As for the Guggenheims and mining capitalists of their ilk, anybody who tried to get them into a prospecting venture would probably receive the cold shoulder. They know too much and don't want to take chances. But let a promoter go around among his Wall Street friends who have just made a million or so in Bethlehem Steel or Crucibaker, and they will take a hundred-thousand-dollar chance on developing a mine without even asking what or where the mine is. In 1915 we have had for the first time since 1906-7 a bull market that has inflamed the popular imagination, that has aroused a speculative fever that already gives signs of spreading into mining.

As for the bearing of the Mexican situation upon the American mining industry, no dissertation is necessary. A mere statement that there seems to be a probability that stable government will soon be existent in Mexico is sufficient. Following that, the return of the mine operators, the reopening and reëquipment of the mines may be seen with the mind's eye. The resumption of mining in Mexico would alone be sufficient to work a revival in the mining industry of the United States.

International Gold Exchanges

Under the conditions that prevail in international trade it seems inevitable that from time to time there should be balances that can be settled only by the actual physical transfer of gold from one nation to another. These occasions arise in normal times, so that every year considerable amounts of gold have been shipped from New York to London or Paris, probably to be returned some months later. At the present time there is a specially striking illustration of this, the abnormal war conditions having brought about an extraordinary balance of trade in our favor. The great loan that has just been made here is partly an attempt to adjust matters through credit and to avoid further unusual shipments of gold.

We do not wish to discuss here the higher problems of finance involved in the loan transaction, but to call attention to a certain amount of waste and loss which is involved in this physical transfer of gold. The loss of interest during the period of transfer, the cost of transportation, the necessity of guarding and insuring the metal in transit, the danger of loss from theft or accident, the waste of metal by abrasion—all combine to make up a perceptible sum, which in the case of large shipments amounts to a considerable tax on the transactions. This cannot be avoided as long as we must cart our gold back and forth as the balance of trade fluctuates one way or the other.

There is also a further cause of loss of which we do not always take account. These transfers of gold are often necessarily made in coin that is foreign to the country in which it is delivered. A shipment of gold from Eng-

land to this country, for instance, may be all in American eagles, but more often it is all or in part in British sovereigns. Thus in a recent shipment of about $20,000,000, two-thirds was in British coin. Under existing American law foreign coin can be held and counted in current bank and treasury balances as gold bullion, but there are rather stringent regulations as to weight, allowance for alloy and other matters, so that bankers usually prefer to undergo the expense and trouble of recoinage. The case is very much the same when American gold coins are sent abroad. If it seems probable that they are to be retained in England or France for any length of time, a considerable part of them will be recoined into sovereigns or 20-franc pieces, notwithstanding the accompanying loss.

It has been proposed many times that this loss, or discount, might largely be avoided by the agreement of the chief commercial nations upon an international gold coinage. In advocacy of this suggestion it is argued that the values of an English sovereign, an American half-eagle, a French 25-franc piece, a German 20-mark piece, a Russian 10-ruble piece and a Japanese 10-yen piece are so nearly alike that a coin which would represent them all could be made with such slight variations from the original that the coinages of the various countries would not be perceptibly affected. It would not be necessary to change the names of the coins or to make more than very slight variations.

We are disposed to regard this idea, however, as impracticable, believing that careful consideration of it would bring to light as many difficulties as there are in the case of the proposal to discard the existing system of weights and measures in the English-speaking countries and substitute the metric system. What would be more to the point, we think, would be an international agreement respecting the fineness of the several coins and acceptance thereof, so that it would be unnecessary to remelt and recoin them so often after an exchange, merely through simpler regulations as to weighing and valuation.

Comparison of Crushing Tests

Some system for comparing crushing tests so as to give real information is badly needed. Many suggestions have been made, but none of them has met with universal approval. The difficulty of getting a satisfactory basis insures a welcome for every new plan. The latest is a suggestion by M. K. Rodgers, in a paper to the American Institute of Mining Engineers. The data Mr. Rodgers wants to include are these: Descriptions of the machines employed; the method and material used in foundations; the locality from which the rock or the ore was obtained and its geological, mineralogical and physical characteristics; power consumption of the machine running with no load and with full load, the units of power being 1 hp. per 24 hr.; the capacity of the machine in tons of 2,000 lb. per 24 hr.; the duty in tons per horsepower-day, and a careful statement of the screen analysis of both the feed and product, in accordance with the proposed A. I. M. E. standard-screen scale. It is proposed that whenever a rock-crushing test is reported, all of the factors mentioned shall be given in detail.

There is no doubt that Mr. Rodgers' suggestion ought to be acted upon, though it could be amplified. It does not go far enough. All operators are well aware that, aside from the factors mentioned, there are many others that have more or less influence upon results. They ought to be considered. Besides, there is not much profit in finding out what kind of ore you have by working it in a certain machine. It seems better to find out how good the machine is by testing it upon the ore to be crushed, and this process requires some unit for expressing the character of the ore itself. In other words, a unit factor must be found that will explain the character of the rock; then the work done upon it by different machines can be intelligently compared. Consequently it will be possible to select the best machine to do the required work. Unfortunately, the basis for comparison has not yet been agreed upon.

Those interested in the subject are aware of the discussion, which has been occupying a prominent place in the technical press for the last three or four years, regarding the accuracy of the laws of Rittinger and Kick, one of which has been advocated by Stadler and the other by Gates. The discussion is still on. A universal standard, mathematically true, is the logical beginning, so it must be first decided which of these laws is the correct one to apply and which system of units to use. Stadler's energy-unit is advantageous if it be proved that Kick's law is true. Gates' unit, using the crushing-surface diagram, is also easily applicable and readily useful if it can be proved that the basis of his argument, which rests on Rittinger's law, is correct. In a general review of the situation, then, it may be said that while we welcome every step, no matter how small, toward standardizing test reports, the field of rock-crushing comparisons will never be complete until a permanent foundation has been laid.

The many current reports of steel consolidations carry one back to the days of the formation of the Steel Corporation and other well-known combinations. As nearly as can be stated with any approach to precision, three strong financial groups are in the field. The most prominent of these is the Schwab, or Bethlehem Steel, party, which is believed to have the backing of the Carnegie interests; the second is the Corey-Midvale group, understood to be supported by Standard Oil interests; and the third is the Downer-Frick party, which now controls the Cambria Steel Co., and is contending with Bethlehem for the ownership of the Pennsylvania Steel Co. The outcome is still far from certain.

The discussion of the first report of the Committee of Standardization of the Mining and Metallurgical Society of America, by the members of the New York section, as reported in the September bulletin of the society, brought out some excellent ideas. The discussions that take place at the meetings of this society are always frank and illuminating and show the benefit to professional men of meetings where such discussions may be developed. The monthly bulletin of the Mining and Metallurgical Society is a relatively small publication, but it is one of the most useful issues of our technical literature.

An increased use of shoveling machines and greater activity in their invention and perfection may be looked for as a result of the present involuntary restriction of immigration. In good times one of the classes of mine labor hardest to get is muckers. We may look to see an aggravated scarcity in the near future.

BY THE WAY

A summer-school mining student was assigned to investigate the details of breast mining at the colliery visited by his class. Recalling an engagement with a demure maiden of Hazleton, he made a short day of it; but, to his consternation, upon emerging from the shaft he encountered the instructor in charge. Without waiting for an accusation, he hastily exclaimed, "Why, Professor Bell, I learned everything there was to know and I'm on my way to work up my notes." "Ah, Mr. Morris," was the reply, "just this morning I met an old fellow who has been mining for twenty-five years, and he tells me that he learns something new every day. But you have mastered it all in a few hours. I congratulate you."

⁂

Must we furnish a wire-gauze jacket for the mule-barn cat or shall we ground him? asks the *Colliery Engineer.* In other words, must we furnish "permissible cats as well as permissible explosives"? An accident reported from New York City seems to suggest an unsuspected danger lurking in the cat's fur. According to the newspapers there was an explosion in a gas chamber used by the Society for Prevention of Cruelty to Animals to asphyxiate stray cats and dogs, ordinary illuminating gas being used. The formation of an explosive mixture in the chamber could easily be accounted for, but what fired it? Someone who had seen pussy's fur snap when stroked suggested that the cause was an electric spark caused by the rubbing together of the frightened cats. Thus another indictment is laid against our childhood's friend.

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The new British budget, which provides for a supertax of 50% on the profits of all British companies, has already caused the removal to the United States of the headquarters of several companies representing South and Central American gold mines, says a London dispatch to the *Times.* Mining men assert that unless the tax be reduced, this movement will become so great that New York, instead of London, will become the mining capital of the world. Mines whose production is just beginning are particularly hard hit. Unlike tea and rubber companies, mining companies have not been enabled by the war to raise their prices. The excess of profits is determined under the new ruling by subtracting from the income for the current year the average income for any two of the last preceding three years. Mining companies just coming into the field have no such opportunity, and will be compelled to pay 50% of their total profits for the year. The tendency to remove headquarters to the United States is becoming so pronounced that mining interests in London are bringing pressure to bear on Chancellor of the Exchecquer Reginald McKenna to have the supertax modified in favor of gold mines. A correspondent to the *Financial Times* points out that Rand gold-mining companies are already heavily taxed. In the first place, a profits tax is payable by the mining companies to the government of the Union of South Africa, and, secondly, a special war tax has been levied on the mines as a contribution toward the recent campaign. In addition, the shareholders resident in the United Kingdom have to bear the income tax (which is deducted in the ordinary way as unearned income from the dividends); as this rate will now be subject to a further increase, surely the shareholders are already bearing more than their legitimate sh re of the burden.

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October Mining Dividends

Dividends disbursed in October, 1915, by 31 United States mining companies making public reports amount to $5,911,791, as compared with $3,551,460 in October, 1914. Industrial and holding companies allied to mining paid $3,315,458, as compared with $2,479,629 a year ago. Canadian and Mexican companies paid $1,359,588, as compared with $1,078,241 in October, 1914.

The totals for the first 10 months of the year are as follows: Mining companies, $57,311,674, as against $49,242,100 in 1914; metallurgical and holding companies, $65,441,802, as against $70,127,102 in 1914; Canadian and Mexican mines, $7,441,708, as against $13,680,365.

United States Mining Companies	Situation	Per Share	Total
Anaconda, c.	Mont.	$1.00	$2,331,250
Arizona, pfd. A, c.	Ariz.	....	5,769
Bunker Hill Con., g.	Calif.	.02½	5,000
Bunker Hill & Sullivan, l.s.	Ida.	.25	81,750
Bingham-New Haven, c.	Utah	.20	45,738
Butte-Alex. Scott, c.	Mont.	.15	11,100
Cardiff.	Utah	.25	125,000
Center Creek, z.	Mo.	.15	15,000
Champion, c.	Mich.	2.00	200,000
Daly-Judge, s.l.	Utah	.25	75,000
Golden Cycle, g.	Colo.	.02	30,000
Goldfield Con., g.	Nev.	.10	355,915
Homestake, g.	S. D.	.65	163,254
Hecla, l.s.	Ida.	.07	70,000
Interstate-Callahan, z.	Ida.	.50	230,000
Iron Blossom, s.l.g.	Utah	.05	50,000
New Idria, g.	Calif.	.50	50,000
New Jersey Zinc, z.	U. S.	2.00	700,000
North Butte, c.	Mont.	.50	215,000
Portland, g.	Colo.	.03	90,000
Prince Con., l.s.	Utah	.02½	25,000
Silver King Coalition, s.	Utah	.15	187,500
Silver King Consolidated, s.	Utah	.10	62,758
Success, z.	Ida.	.06	90,000
Tonopah, g.s.	Nev.	.15	15,000
Tonopah Ext., g.s.	Nev.	.07½	70,757
Tennessee, c.	Tenn.	.75	150,000
Utah Apex, c.	Utah	.12½	66,000
Vindicator, g.	Colo.	.03	45,000
Wasp No. 2, g.	S. D.	.10	50,000
Wolverine, c.	Mich.	5.00	300,000

Industrial and Holding Companies	Situation	Per Share	Total
Am. Smelters Sec. pfd. A	U. S.	$1.50	$255,000
Am. Smelters Sec. pfd. B	Mex.	1.25	375,000
Bethlehem, pfd.	U. S.	1.75	239,625
Brier Hill Steel, pfd.	U. S.	1.75	83,452
California Exploration.	U. S., Ont.	.12	28,139
Cambria Iron.	U. S.	2.00	169,360
Guggenheim Exploration.	U. S., Mex.	1.00	833,732
Lanyon-Starr, pfd., z.	U. S.	*24.00	*120,000
Penna. Salt.	Penna.	2.00	100,000
Republic Iron & Steel pfd.	U. S.	†2.00	†408,338
Sloss-Sheffield.	Ala.	‡1.75	‡117,250
St. Mary's Mineral Land.	Mich.	1.00	160,000
United States Sm., Ref. & Min.	U. S., Mex.	.87½	425,562

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Beaver, g.	Ont.	$0.03	$60,000
Butters-Salvador.	C. A.	.25	36,450
Canadian Mining, s.	Ont.	.12	259,375
Consol. Min. & Sm., l.s.z.	B. C.	2.00	116,098
Hollinger, g.	Ont.	.20	120,000
La Rose, s.	Ont.	.05	37,466
Lucky Tiger, g.s.	Mex.	.09	64,380
McKinley-Darragh-Savage, s.	Ont.	.03	67,431
New York & Honduras Rosario, s.g.	C. A.	.30	60,000
Nipissing, s.	Ont.	.25	300,000
Peterson Lake, s.	Ont.	.01½	63,000
Porcupine-Crown, s.	Ont.	.03	60,000
Rambler-Cariboo, l.z.s.	B. C.	.01	17,500
Seneca-Superior, s.	Ont.	.10	47,888
Standard, s.l.	B. C.	.02½	50,000

* In payment of deferred cumulative dividends to July 1, 1915.
‡ Scrip. † ½% paid on account of back dividends.

The drop in metallurgical and holding companies' disbursements is less, considerably, than the difference made by the passing of the dividends on United States Steel common. The returns from Mexican and Canadian companies for the first time this year show an improvement over the corresponding month of last year. As to the position of this country we are not yet in position to throw up our hats and shout with disturbing loudness, for in 1913 United States mining companies paid $62,175,610 in the first ten months of the year.

PERSONALS

J. Ernest Snelus left London recently for Nigeria.

R. S. Innes, of London, has gone to the Belgian Congo.

Frank Rowley has left London on his way to Tasmania.

R. V. Barton has gone from New South Wales to Chosen.

W. R. Feldtman is in West Africa on professional business.

J. Kobuse has been examining mining property in Chosen.

A. G. Wolf, of Denver, is in Gunnison County, Colo., on professional business.

H. C. Hoover, who is doing such wonderful work for the Belgians, is spending a week in New York.

William Thomas left London recently on his way to the Champion Reef Mine in the Kolar District, Mysore, India.

Frank Reed, inspecting engineer of mines in New Zealand, has been appointed also chief inspector of coal mines.

Charles Botsford, of New York, has placed two Kirkwood exploration propositions with Michigan Copper Country people.

W. H. Wright, of the Malm-Wolf Co., has completed the examination of placer properties near Alma, Colo., and has returned to Denver.

L. F. S. Holland has returned to Los Angeles, Calif., after making examinations in Pioche, and Cherry Creek, Nev., and in San Bernardino County, Calif.

Lieut. J. Cameron, mining engineer of Toronto, who enlisted for service abroad in the first Canadian contingent, was wounded in a recent engagement.

C. W. Whitley, manager of the American Smelting and Refining Co., in Utah, and W. H. Howard, metallurgist for the company in the West, are visiting New York.

John Daniell, mining engineer of Laurium, Mich., is home from the new Kirkwood district in Canada, having secured a property which will be financed by Laurium people.

James J. Ormsbee, formerly superintendent of the El Paso smeltery, and more recently of the Tacoma and Hayden plants, is spending a couple of weeks in New York, with headquarters at the A. S. & R. Co.'s offices.

H. J. Rahilly has returned from the Matanuska coal field in Alaska, where he spent six months on professional business for the General Land Office. He has accepted a position with the Bureau of Mines and is now stationed at Pittsburgh.

L. Selmi, chief chemist-metallurgist of the Otis Steel Co., Cleveland, has resigned, effective Nov. 1, when he will take charge of the chemical and physical laboratories of the new steel plant of Corrigan, McKinney & Co., Cleveland, Ohio.

Angus W. Smith, largely interested in the White Pine Extension in Ontonagon County, Mich., is in the district with Frank McM. Stanton of New York, superintending the construction of the shafts and continuance of diamond drilling.

R. B. Bostwick, superintendent of the openhearth steel department No. 3 of the Homestead works of the Carnegie Steel Co., has resigned to become associated with the Upson Nut Co., Cleveland. T. J. Jamison has succeeded Mr. Bostwick at Homestead.

OBITUARY

Charles Smith died recently at Hubbell, Mich. He was chief clerk of the Calumet & Hecla smelting plant at Hubbell, and one of the oldest employees of that corporation. He was employed at the smelter from the day it started. He served many years in the legislature and on the county board of supervisors. He was prominent in Masonic circles.

Howard E. Burton, well-known assayer, metallurgist and operator of Leadville, Colo., died Oct. 16 at Glenwood Springs, of typhoid-pneumonia after a very brief illness. His death was a shock to his host of friends, for he was a man in the prime of life and in good health. He was born at Lake Geneva, Wis., in 1870. He graduated from the University of Wisconsin in 1893. In 1895 he located in Leadville as chemist of the Elgin smeltery and he has lived there continuously since that date. Upon the closing down of the smeltery he opened a custom assay office that he maintained to the time of his death. He was known by his liberal advertising that resulted in a large mail-order assay and analytical business. He was largely interested in many of Leadville's important discoveries and projects. Recently he has been exploiting molybdenum deposits a few miles north of Leadville. He was one of the owners of the new smeltery at Leadville erected for custom treatment of the non-sulphide zinc ores of the district. During the early years of cyanidation he erected a leaching plant at the Penn mine north of the city and attempted to treat the enormous mine dumps without crushing, but his efforts were only partially successful. In a similar way he has ever been foremost in inaugurating projects for furthering the interests of the Leadville region. He was a member of the Masons, Elks, Phi Delta Theta, Woodmen of the World and the Royal Arcanum. His funeral was held Oct. 19 under the auspices of the Masonic fraternity, at Leadville.

SOCIETIES

New Mexico School of Mines is building new metallurgical building and other edifices at Socorro, N. M. Power plant with 50-kw. generator and two oil engines to be installed.

American Society of Mechanical Engineers—A meeting of the New York Section will be held at the Engineering Building, Nov. 9. Charles Meigs Ripley, will present the paper of the evening, which covers an investigation of the size, age and performance of gas-producer power plants in New York City and neighborhood. The paper reports the results of a census showing the owners' opinions regarding repairs, labor and depreciation; satisfaction and dissatisfaction which they have experienced with their plants; and future policies.

American Institute of Mining Engineers—The Columbia Section will hold its annual meeting at Wallace, Idaho, Nov. 19 and 20. The first day and evening will be devoted to technical papers and discussion, and the second day will be given over to sightseeing, probably a visit to the great Interstate-Callahan zinc mine. The program will include a paper on "Progress in Ore Dressing" by D. W. Buckby, superintendent of the Stewart mill. "Zinc Smelting and Smelting Rates" is the subject of a paper that will be presented by W. L. Henry, of the Empire Zinc Co., of Denver. J. E. Chapman, chief accountant of the Federal Mining and Smelting Co., will read a paper on "Mine Accounting." The Columbia section includes Idaho, Eastern Washington, Eastern Oregon and part of British Columbia and has 104 members. Members of the Montana section have been invited to attend.

INDUSTRIAL NEWS

The Carbo Steel Post Co. of Chicago has changed its name to the Carbo Corporation. No change in the personnel of the organization has been made.

Industrial Works has established a Philadelphia office in the Widener Building. Complete data and information can be obtained there regarding the Industrial Works line of locomotive, wrecking and freight-handling cranes, pile drivers, grab buckets, etc.

On Oct. 1 the property and business of E. I. du Pont de Nemours Powder Co., of New Jersey, was sold and transferred to E. I. du Pont de Nemours & Co., of Delaware, a corporation organized for the purpose of taking over and carrying on the business. The new company assumes all liabilities of the old company (except capital stock and funded debt) and will carry out all contracts of the old company, there being no change in the personnel of the management, operations or methods of handling the business. It will issue capital stock to the amount of $120,000,000. E. I. du Pont de Nemours & Co. the new corporation, bears the name of the original Delaware concern established 1802 by E. I. du Pont de Nemours. The return to the original name is a tribute to the founder and emphasizes the long establishment of the business. The incorporation was made in Delaware because Delaware was where the business originated and the main offices are located in Wilmington. Although the du Pont facilities for manufacturing and selling explosives have materially increased, explosives are no longer the only products of the organization. The chemical business has entered many industrial lines and further extensions are inevitable. Du Pont Fabrikoid Co. a controlled concern is making exceptional progress, and enlargement of its productive capacity has been and probably will be continuous as a result of steadily increasing sales.

Editorial Correspondence

SAN FRANCISCO—Oct. 28

Protection of Investors in mining properties is apparently one of the purposes of the State Corporation Commission which is operated under the blue-sky law. Recently a permit was issued to the Forest Hill Mining Co. to issue 50,000 shares of stock in payment for 2 placer claims and to issue 300 shares for services, upon condition that the shares are accepted at a valuation not less than 25c. per share, the price at which the company is permitted to sell an additional 30,000 shares for development purposes. The commission for selling is limited to 20%, and the 50,000 shares payment for property must be deposited in escrow, pending the financing of the company. In issuing stock to the original incorporators they must enter into separate agreements with the company that they are not receiving their shares as fully paid, but on the same basis as other purchasers. Meantime a mine promoter of San Francisco was arrested at Liveoak on complaint of ranchers in the vicinity that he had collected from them several hundred dollars with which he was to secure rich mining claims in Siskiyou County. The promoter excused himself on the ground that before he had an opportunity to secure the mining property, he was held up and robbed. He may go to prison for obtaining money under false pretence, but the farmers of Liveoak will not get their money back, and are just as apt to bite at another sucker proposition in spite of the blue-sky law, which, of course, has nothing to do with this class of criminal promoters.

DENVER—Oct. 28

Cripple Creek Deep Drainage and Tunnel Company's Executive Committee met, Oct. 12, at Colorado Springs, and decided, among other matters, that, upon the completion of the bore on its present course to the Elkton shaft, its direction be thereafter carried on a line nearly due east to the Golden Cycle shaft a further distance of approximately 8,000 ft. The Elkton shaft should be reached about Jan. 1. Irving Howbert resigned from this committee and was succeeded by Frank G. Peck, another officer of the Portland company. Great credit was given Charles M. Fuller, superintendent of the tunnel, for his excellent work and he has been sent to the Michigan iron regions to investigate mechanical muckers there in use and to decide upon their adaptability in his Roosevelt tunnel work.

Washing and Concentration of Hillside Débris has been undertaken by a new concern known as the Omaha Concentration and Mining Co. At two localities in the Cripple Creek district, this company has installed equipment of its own devising to cull gold from the soil, sand and gravel covering the slopes of the mountains—in the Kitty Hollis claim near Windy Point and in the Isabella territory on Bull Hill. At the former plant, treatment consists of following simple steps. With ordinary horse plows and scrapers the dirt is loosened and delivered to a bin whence it travels by conveyor belt to a stationary half-inch screen that rejects coarse gravel, roots and other worthless material. This half-inch product passes to a trommel with 5-mesh screen through which the finer material is washed by water, the undersize being immediately given its final sizing through a 10-mesh trommel. A spectator judges, from this arrangement, that the proprietors do not expect any coarse gold particles in this "wash." The small quantity of fines finally retained below the screens goes to a Harrington table, a machine for which originality is claimed. This table is a modified gold sluice, with an oscillating, longitudinal motion. Its bed contains semi-round grooves 2 in. deep by 2 in. wide running crosswise, acting as riffles. In these grooves rods of iron with fingers are caused to slide back and forth keeping the sand in motion. Clean-ups are made intermittently by sweeping the concentrate from the grooves. At the Isabella plant, not yet in operation, the first screened product will pass through rolls to release particles of gold in the quartz fragments as it is proposed to treat here both wash and dump material.

SALT LAKE CITY—Oct. 29

A Miners' Strike, involving 370 men was innaugurated at the Silver King Coalition mine, Park City, Utah, following a proposal by the company of a compensation plan, which does not meet with the favor of the men. This is the first strike in the history of the company which has been operating 30 years. According to the plan, the Silver King Coalition Provident & Insurance Association is to be formed, each miner paying $1 a month to the association, and the company a like amount—the funds of the association to be subject to the direction of six trustees, three to be chosen by the miners, and three by the management; in cases of disagreement the general manager of the company to act as arbiter and cast the deciding vote. In case of the death of an employee occurring on the property it is proposed to pay not less than $2,000 to the heirs, this sum being liable to increase at the discretion of the board of trustees; for permanent total disability the payment of not less than $2,000 is proposed, and for partial permanent disability not less than $1,250; and in cases of temporary disability not less than $12 a week, unless the board of trustees shall otherwise direct. The miners also object to the proposal made by the company that all cases be taken to the Holy Cross hospital at Salt Lake for treatment. Up to the present time the men have been paying $1 a month to the miners hospital at Park City. The larger number of the employees went on strike the morning of Oct. 26, leaving engineers and pump men in their places until 6 p.m., Oct. 28, and demanded that they be given the privilege of assigning their $1 to any hospital and the abolition of the company's insurance plant. At 6 o'clock, receiving no reply from the company the engineers and pump men joined the strikers after the mules in the underground workings had been brought out by the miners, and at present the water is coming into the workings at the rate of 600 gal. a minute. Thomas Kearns, general manager of the company, who was away at the beginning of the trouble, has arrived in Salt Lake City, and is awaiting overtures from the miners. If the water rises to the 1,300 level, the new electrical equipment (described on page 747 of this issue) may be seriously injured, it is stated, entailing a considerable loss. About two-thirds of the miners are non-union men, and the greater number are Americans. The Western Federation of Miners has espoused the cause of the Coalition miners, and pledged its support. The men have been warned to act in an orderly manner, and so far there has been no disturbance.

SEATTLE—Oct. 23

Navigation in the Arctic Ocean has closed for the season, according to a dispatch from Nome.

Deals in Broad Pass Mines are falling through because of an apparent intention of the owners to make unreasonable demands of those with capital who are anxious to prospect the ground thoroughly with a view of purchasing. Representatives of capitalists have looked the ground over, but have been unable to make any arrangements with the present owners and it seems likely that little real development work will be done in the district at present.

Larger Output Is Certain in the Fairbanks District, according to the latest figures. Every month this year to date, the output has been larger than the corresponding months of last year and indications are that the same conditions will continue during the remainder of the fall. Last year the opencut operators were hurt considerably by heavy frosts and the cold nights during the early part of September and October, and it is not likely that conditions will be any worse this year. All opencut plants have done well this summer, having had plenty of rain for the greater part of the time and having got an early start in the spring. The dredge on Fairbanks Creek started late but is doing well and will continue to work right up to Nov. 1 if possible. Hiltys plant, on Cleary Creek, is working full time and has increased the output considerably. The Pedro Creek operators are taking out more money than last year. Ester Creek is producing more gold than in 1914. Cleary and Chatanika are fully as good as last year and some of the operators are taking out a great deal more dust than in 1914. Several thousand dollars of gold has come down from the Tolovana district but the district will not show up to its true worth until 1916 and everyone in the Fairbanks district believes that with the increased production of the Tolovana added to the increased production of the Fairbanks district will show the entire territory in the vicinity of Fairbanks a larger producer in 1916 than since 1911.

MORENCI, ARIZ.—Oct. 29

The Clifton-Morenci Strikers' Delegates and the mine managers concluded their deliberations Saturday, Oct. 23, without reaching agreement on a single point. The managers again restated the only conditions under which they will resume work: The federationists must get out and the men must return to work under the pre-walkout conditions. When these requirements are met and normal conditions are restored, the managers will meet the employees, as they have always heretofore been willing to do, and discuss any grievances the employees wish to take up. In order that the public might have a clear conception of the situation, the officials gave out a brief industrial history of the district and a resumé of the incidents leading up to the strike. Owing to the orebodies being small and scattered over a wide area, the district could never have been opened up in the early '80s but for the abundance of cheap Mexican labor. The constantly lowering of the grade of ore, the very small tonnage per man as compared to that in other places in the state (about 3 here to 8 elsewhere), make it impossible for the companies to pay the same wages as are paid at other camps, which the strikers demand. The sliding scale adopted with the improvement of market conditions early this year, although it gave the employees more money at corresponding copper prices than they had received prior to the 10% cut when the slump came one year ago last August, did not give the 10% back in a lump sum. Thus the field was particularly attractive to the federation organizers. Governor Hunt and Attorney-General Jones, told their brethren at the beginning that the strikers' cause was "the cause of Almighty God" and that if the managers didn't "quidado" they might find themselves in "the bull pen." The governor has sent another detachment of troops to the district to guard against the entrance of a few thousand imaginary strikebreakers being assembled at Duncan. Or perhaps he wants to pour oil on the waters on account of petitions being circulated throughout the state for his recall. Young J. Pentland and Willis E. Miller, of Edinburgh, Scotland, members of the Arizona company, who are now in El Paso, have not accepted the invitation tendered by the federation to come to Clifton and "learn just how bad and inefficient their executives are."

CLIFTON, ARIZ.—Oct. 30

Strikers in Clifton-Morenci District have assumed an attitude of "watchful waiting" with the definite understanding that a federal investigation of causes leading up to the strike and of conditions existing at present will be held soon by Commissioner Myers, under direction of Secretary Wilson of Department of Labor and Commerce. The union reports finances plentiful and more in sight. There is no indication that the strikers' committee is contemplating presenting a new proposition to mine managers.

HOUGHTON, MICH.—Oct. 30

Taxation of Mines is likely to become a prominent issue in the Lake Superior district next month. At the last meeting of the board of equalization of Houghton County, the assessed valuation of Adams, which includes the three mines of the Copper Range Consolidated and is represented on the county board of supervisors by F. W. Denton, the manager of the mines, was raised more than $2,000,000 above the figures of Mr. Denton. He immediately protested when the report was made to the county board of supervisors. Supervisor Seeber, representing the St. Mary's Mineral Land Co., also protested, claiming that if the additional figures were spread on the Adams township taxes they would have to be paid, in large measure, by St. Mary's company, as they would not be put back on the mines. The state board of tax commissioners set aside a date for hearing and review of Adams township mineral land and mining assessment. Supervisor Denton claimed that the assessment of $16,000,000 on Adams township was too high and that the assessments of $29,000,000 on Calumet mines and $6,000,000 on Osceola mines were too low. He also complained that the method of reaching taxation valuations was unreasonable.

ISHPEMING, MICH.—Oct. 9

The Outlook on the Michigan Iron Ranges is excellent. It has been a good many years since the operators have started opening mines on the Michigan iron ranges when the end of navigation for the season was in sight. However, such is the condition right now, and it looks as though the coming winter would witness considerable activity. Shipments are continuing at a steady rate, and more ore would be going forward if the railroads could supply the cars. The Chicago & Northwestern Ry. placed an order last week for 500 new steel cars, and the Lake Superior & Ishpeming road ordered 400 steel cars last spring that have not been delivered yet. The operators feel certain that they are going to receive an advance of 50c. a ton for their product next year, and several of the companies have already announced that they will not close any more contracts at the present selling prices. The Cleveland-Cliffs Iron Co. and Corrigan, McKinney & Co. have withdrawn from the market, although both concerns have ore in stock that they might sell and ship this season. The latter company resumed operations at the Tobin mine, in the Crystal Falls district, this week, placing a large number of men at work underground. This is one of the big mines of the Menominee range and employs between 400 and 500 hands when working to capacity. It was closed over two years. This same company has taken a lease on the Cole & McDonald property, near Crystal Falls, and will start development work shortly. Cole & McDonald secured possession of the tract and drilled it thoroughly, proving up a large deposit of ore of good grade. The Fortune Lake Mining Co., a subsidiary of Oglebay, Norton & Co., will sink two shafts on the property recently drilled near Fortune Lake, in the Crystal Falls district. It was only a few weeks ago that a contract was awarded to change the course of Briar Hill Creek, which flows over the orebody, and which would make mining difficult. The Cleveland-Cliffs Iron Co. has added 60 men to its force at the Cliffs shaft mine, at Ishpeming. The production of this property is to be increased several hundred tons a day by doing part of the tramming and hoisting at night. The Volunteer Ore Co. has resumed operations at its mine at Palmer, which has been idle over a year. The outlook is certainly encouraging in the Michigan field.

TORONTO—Oct. 26

A Hydro-Electric Plant to supply power to the new gold district of Boston Creek, a short distance from Swastika, is to be financed by a local syndicate. If there is any surplus of power it will probably find a market at Kirkland Lake.

Many Wide Dikes Have Been Uncovered in the Kowkash gold area. A number of prominent Porcupine mining men have been prospecting in the district. An important find of Tellurides about 35 mi. west of Kowkash is reported. A direct Pullman car service from Toronto to Kowkash is in operation.

The Zinc Deposits at Burbridge, about 72 mi. from Ottawa, in the Gatineau region, have been investigated by J. D. Macfarlane, who has returned with samples of ore and confirms reports as to the richness of the deposit. He states that every 750 tons of ore mined will yield 100 tons of zinc, and that in one spot 40x25 ft. in area there is 40% zinc. The outcrop, which is 2½ mi. from Burbridge station, is of highly crystalline limestone at the base of a limestone ridge. The deposits were found some years ago, but as the locality was difficult of access, and zinc not so much in demand as now, the claims were simply staked and no effort made to develop them.

VICTORIA, B. C.—Oct. 26

Two Finds of Copper have been made recently that promise to be of more than usual interest. One is on Owl Creek in the Lillooet, where chalcopyrite and native copper occur in a silicious schist. The body appears to be of considerable extent and samplings made by J. A. Beaudette for Foley, Welch & Stewart show about 5% copper. The other discovery is near Jones Lake in the Hope district. It was covered by a glacier, but the extremely long warm season melted the ice and exposed it. The vein has a width of from 28 to 50 ft. and has unusually high mineral content.

CALCUTTA—Sept. 8

New Indian System of Weights—The Indian Government in October, 1913, appointed a committee to consider the question of uniform weights and measures within the Indian Empire. The recently published report of this committee is of considerable importance, affecting as it does, the commercial transactions of one-fifth of the world's population. The adoption of the metric system and alternatively of the British, was considered and rejected. The former, principally upon the ground that the use of decimals was alien to the customs of the Indian people. The latter, because it would have compelled an alteration in the weight of the tola, the most important standard of weight in use. Moreover, the weight of the tola and of the rupee being identical, the weight of the coin would also have had to be altered. The committee recommended that the Bengal, or Indian railway, weights should be adopted for universal use throughout the Indian Empire, with the exception of Burma, where a uniform system suitable for that province already obtains. The proposed weights are as follows, for India: Eight khaskhas make 1 chawal; 8 chawals, 1 ratti; 8 rattis, 1 masha; 12 mashas or 4 tanks, 1 tola; 5 tolas, 1 chatak; 16 chataks, 1 seer; 40 seers, 1 maund. A tola, the weight most used with reference to silver, is equal to 180 grains troy.

The Mining News

ALASKA

INDEPENDENCE (Seward)—Two hundred ounces of gold in five days with only 10 men and a miserably small plant is record of this property on Willow Creek. L. S. Robe is superintendent.

NEVADA CREEK (Douglas Island)—Mike Hudson, of Douglas is in charge of gang of 20 men that has started work at Nevada Creek mine which was recently sold after much financial distress following its operation by English capital. Development will be pushed rapidly.

ALASKA COPPER CORPORATION (Strelna)—Consulting Engineer Du Bois has finished his work for the year and has left for East. Compressors and drills will be installed in near future. Property is situated off Copper River & Northwestern Ry., in Copper River Valley about 25 mi. from famous Kennecott locations.

CACHE CREEK DISTRICT (Seward)—J. H. Rice, an operator on Willow Creek, in Cache Creek district, has just arrived in Seward from his placer claims. Owing to shortage of water he was able to work only about 45 days, but took out, in this time, $4,000 in dust. He describes property as having three distinct paystreaks of varying width and richness. Richer gravel on bedrock occasionally ran as high as $7 to the pan. Dust is high-grade, running nearly $18 per oz. after melting. Mr. Rice will shortly make the return trip of about 300 mi. with intention of remaining upon claims through winter.

CALIFORNIA

Amador County

ERNEST (Jackson)—Reported good body of ore disclosed at this mine near Doyle place.

BOITANO (Jackson)—Property reported to have been bonded; definite information not available. Situation adjoining Hardenberg makes it attractive, though Hardenberg is still idle.

FELLOWCRAFT (San Andreas)—Mine has been unwatered and well mineralized ledge exposed on 200 level. Thorough test of both 200 and 100 levels will be made before development is begun.

Butte County

BUTTE COUNTY R.R. reported to have been negotiated for by Southern Pacific and that latter company will extend line from Stirling to Westwood in Lassen County to connect with Fernley & Lassen branch. Butte County R.R. is operated by Diamond Match Co. between Chico and Stirling, under lease which will soon expire. Extended line will place Chico on transcontinental line and open up new mining regions.

Colusa County

MANZANITA (Williams)—This quicksilver mine at Sulphur Creek leased to H. B. Bradford, of San Jose. Reported that rich pocket of cinnabar has been disclosed. Mine closed down two or three years ago by men who purchased of George V. Northey, who introduced concentration into metallurgy of cinnabar. Northey made successful concentration by use of Gilpin County bumpers and canvas tables. Though method was crude, attention of quicksilver miners was attracted to economic feature of practice. Some improved methods have been experimented with, but most of larger operators still continue old process of direct roasting of coarse ores and retorting fines.

Eldorado County

CHEROKEE FLAT (Georgetown)—Davis and Federwitz, of Placerville, are developing this property on middle fork of American River, situated on Mother Lode. Vein is large and of good milling value and will be tapped by crosscut tunnel at depth of 100 ft.

STEAM-SHOVEL and locomotive equipment is being installed on Webber Creek, 6 mi. from Placerville, for operation of gravel mines. Gravel dug by steam shovel will be dumped into 4-cu.yd. side-dump cars and hauled by locomotive to sluices. This is first time that combination of steam shovel and locomotive has been adapted to gravel mining in California. George W. Kirkley is manager.

NEWTOWN RIDGE gravel mines at the head of Missouri Cañon will be opened by a 500-ft. crosscut tunnel to be driven at depth 200 ft. below old river channels believed to contain cemented gold-bearing gravel in quantity to make undertaking profitable. At intersection of tunnel and channel raises will be driven. L. A. Bender and Charles Wright have taken bond on 160 acres of land for this purpose.

Kern County

OLD MILLS ANTIMONY MINES are being operated in a small way. Carload of ore is reported ready for shipment. Property is situated in Devils Cañon about 7 mi. from Caliente.

CALIENTE CAÑON mines owned by J. B. Ferris, of Bakersfield, reported sold to Western mining men at large figure. Said to be large amount of low-grade ore disclosed by small amount of development.

Nevada County

HIGH-GRADING at Empire mine resulted in sentence of Andrew H. Coggins to 4 years in state prison. Coggins pleaded guilty in Superior Court. Archibald Boone, an accessory, escaped punishment, as ore had been recovered. Coggins had stolen about $50,000 worth of high-grade and specimen ore; but he had not disposed of any of it to his own profit. Boone assisted him in removing stolen ore from Nevada City to San José; but neither of them profited by the theft.

ENGLISH MOUNTAIN (Nevada City)—High-grade ore reported by Henry C. Schroeder who is operating under lease.

NORTH STAR (Grass Valley)—New hoist installed complete and in operation. Ore is being dumped into steel bins which are part of this new equipment at Central shaft.

Tulare County

TULARE COUNTY POWER CO. (Tulare)—Property sold to Mount Whitney Power & Electric Co., and corporation dissolved by court.

Tuolumne County

FLOODING OF MINING CLAIMS by Goodwin dam will be taken into court in suit for $10,000 damages by H. A. Preston, postmaster of Jamestown, against Oakdale and San Joaquin irrigation districts.

COLORADO

Boulder County

BOULDER TUNGSTEN PRODUCTION CO. (Nederland)—Has let contract to Colorado Iron Works, Denver, for erection, within 90 days, of complete concentration mill to have crushing capacity of 60 tons, and concentrating capacity of 35 tons per day. Flowsheet is as follows: Bins; conveyor belt to grizzly; Blake crusher; belt conveyor to 27x14 rolls crushing to ¾ in.; 20x5½ rolls crushing to 12 mesh; elevator to impact screens; jigs; classifiers; Wilfleys; Deisters; tails and oversize from screens elevated to 3x4 ball mill; cone thickeners; slime tables.

Clear Creek County

PRIMOS CHEMICAL CO. (Empire)—On Oct. 16, closed down operations in molybdenite mine in Daily district until cloud on title to property has been cleared by litigation now being waged between original owners who sold to this company years ago.

SANTIAGO (Georgetown)—Recent development operations in this mine in East Argentine district have opened vein of ore 2 to 4 ft. wide which ranges in value from $20 to $45 a ton in gold, silver and lead. During the past month about $4,000 worth of ore has been produced from development. The product is hauled in wagons to Georgetown whence it is shipped to smeltery at Salida. Systematic development is being pushed under direction of Frank Ricci.

Dolores County

EMMA (Rico)—Arrangements are being made to install flotation apparatus in the mill to handle complex sulphides.

RICO-WELLINGTON (Rico)—This and Rico-Consolidated, both owned by Knight Investment Co. of Salt Lake City, shipped 62 carloads during September.

Eagle County

TWILIGHT (Fulford)—John Weiskopf and John Storey have emerged from their mysterious camp in mountains south of here, bringing wonderful specimens of free-gold ore. They declare they cannot do further prospecting until spring, since their discoveries are very high. There promises to be a stir among prospectors in this region next spring.

Lake County

GRANITE TUNNEL (Granite)—Julius Hoffman, stockholder and creditor in this defunct company, has purchased all its properties at sheriff sale.

GARBUTT (Leadville)—Large double-drum hoist has been installed. Hereafter hoisting will be done in both compartments of shaft. Ore reserves are said to be very large. Building of proposed mill has been postponed until next spring owing to climatic conditions.

Ouray County

NATIONAL BELL (Ouray)—Davey Leasing Co. shipped 2 carloads to Durango smeltery, part of the material coming from mine dump.

WANAKAH (Ouray)—Large body of 5% copper ore carrying small amounts of gold and silver, making average grade of material about $15 per ton, found in old workings. Stuff was not marketable during former operations, but is excellent for company's smeltery now.

Pitkin County

CHARLES HARRIS AND KEMPER DUNLAP, prospectors, claim to have made important finds of ores carrying tin, antimony, copper, lead and zinc in the country about the heads of Avalanche, Capitol and Snowmass creeks in the Elk Mts., about 12 mi. west of Aspen.

San Juan County

SILVER LEDGE (Chattanooga)—Leaser Bonavida is mining and milling a fine grade of galena-sphalerite carrying gold and silver. Mill makes two clean products.

ALL O. K. (Silverton)—This property in Minnie Gulch is being reopened and developed by James O'Kelly. Main crosscut tunnel is being advanced toward Kittimac property. Recent metallurgical tests on All O. K. ore indicate that it can be treated satisfactorily by cyanide process.

COLUMBUS (Animas Forks)—Manager Arthur Johnson estimates that tunnel will reach Columbus oreshoot during early part of January. Drifts will be driven both ways on vein. Shipments of ore are being made from upper workings and will continue as long as railroad is open.

GOLD KING (Gladstone)—Has been decided to convert entire plant to flotation process. Production of ore will necessarily cease during changes in mill, but underground development will proceed in anticipation of greater mill demands. Plans contemplate largest flotation mill in state.

TOMBOY (Telluride)—During September, mill treated 13,000 tons, recovering $45,000 in bullion and $40,500 in concentrate. Monthly expenses were $56,700. Despite low average value of this ore ($6.58 per ton) the cost of $4.36 per ton is low for the conditions prevailing in this rugged region.

Teller County

CRESSON (Cripple Creek)—Mining and hoisting suspended few days last week while repairs were made in shaft.

GOLD DOLLAR (Cripple Creek)—Dell Brothers, leasing 500 level, shipped 30 tons from new shoot, receiving returns at rate of 2.21 oz. gold per ton.

GOLD SOVEREIGN (Victor)—Stockholders have voted to extend life of incorporation for another 20-year period. Mine is leased to Gold Sovereign Mining and Tunnel Co.

VINDICATOR CONSOLIDATED (Independence) — Net earnings from operations for third quarter of 1915 were little over $225,000, out of which five additional notes, of series issued in purchase of Golden Cycle mine, were paid, making 19 in all, together with six months' interest on balance of series remaining unpaid. This was accomplished with but small reduction in cash balances from those of previous quarters. Developments on 18th level of Golden Cycle disclose two different oreshoots in main veins amounting together to over double length and volume of orebody on 17th level, but of lower average grade. Further development on 17th and 16th levels has opened additional ore. About four-fifths of shaft sinking for two additional levels has been accomplished, including cutting of station for 19th level.

IDAHO

Shoshone County

GOLDEN WINNIE (Murray)—Erastus Smith, owner of this tungsten property, has given 30-day option to Bennett Bates on basis of about $50,000. Has small mill run by water power. Several small shipments have recently been made.

REINDEER-QUEEN (Mullan)—E. B. Crawford has been elected president. Car of high-grade copper ore will be shipped soon. Driving on vein is under way and tunnel has just entered Queen ground for first time; face of drift shows 4 ft. of shipping ore, according to reports.

MINNESOTA (Wallace)—Under management of O. B. Wallace, who organized Interstate and managed it until its consolidation with Callahan, Minnesota Mining Co. is developing group of claims adjoining California, on Nine Mile, about 2½ mi. from Wallace.

GERTIE (Wallace)—Long Gertie crosscut adit has been driven 3,720 ft. in 12 months, average of 311 ft. per month under system whereby miners receive bonus of $25 to $40 per month. Adit is 6 by 8-ft. section and has cost $67,000, which includes cost of machinery and other equipment.

MARK COONEY (Burke)—M. W. Neary, of Spokane, has made payment of $25,000 on option on Mark Cooney group, near Burke. Second payment of $75,000 is due in one year and final payment of $75,000 six months later. Property consists of 4 claims, patented in 1901 and idle since.

AMERICAN-COMMANDER (Mullan)—Preliminary work was started on American-Commander this week, preparatory to extending lower tunnel to vein. Will secure power from Independence Lead Mines Co. American-Commander is supposed to be on Hunter vein and good ore showing is reported in upper tunnel.

CONSTITUTION (Pine Creek)—Ex-Senator George Turner and Frank G. Graves, of Spokane, have taken option on large block of stock of Constitution M. and M. Co. Mine has shipped 3 cars of crude zinc ore, which has been penalized by smelters on account of 10% lead content. Compressor and hoist will be installed at once and if developments justify mill of 150 tons capacity will be built.

MONITOR (Adair)—Has recently started 6,000-ft. tunnel near railroad at Adair which will explore its ground at depth of 1,400 ft. Tunnel is designed to form outlet for adjoining properties also. Tunnel is now in 500 ft. New boarding and bunkhouse just completed to accommodate 16 men, also new compressor building. Old workings on Idaho-Montana divide consist of shaft 700 ft. deep, from which copper ore amounting to $70,000 has been shipped to Saltese, Mont. Buildings at upper works burned in forest fire several years ago. Ore returned 20% copper and considerable gold.

MICHIGAN

Copper

MOHAWK (Kearsarge)—Copper content risen remarkably in six months, now showing 21 lb. per ton.

WHITE PINE (Ontonagon)—Railway connection, by way of St. Paul and Calumet & Hecla spur will be completed.

TAMARACK (Calumet)—Lake Superior shareholders are convinced that there will be no consolidation with Calumet & Hecla.

MASS CONS (Mass)—This property has increased actual recovery to 20 lb. per ton. Closer selection of rock necessary because of limited mill capacity explains situation. October output will be half million pounds. One Quincy furnace operates on Mass mineral full time.

CENTENNIAL (Calumet)—Meeting of shareholders held this week decided to select committee to make proposal of outright sale to Osceola Consolidated, regardless of outcome of Tamarack-Calumet & Hecla deal. Names of committee withheld until acceptances are certain.

CALUMET & HECLA (Calumet)—Estimated output for this company and subsidiaries for 1915 is 155,000,000 lb. Costs will average for all properties about 9½c. per lb. Within two weeks another of the big furnaces at the Dollar Bay plant will go into operation. This will mean employment of 25 more men at this plant where smelter force is already 25% above normal.

Iron

LAKE ANGELINE (Ishpeming)—Shaft being repaired. Some exploratory work is to be carried on underground. Mine closed for months was recently sold to Cleveland-Cliffs Iron Co. If mining is started again new hoist will be put in. Air will be procured from Lake mine. Only rock drifts are open for passage now.

MIINESOTA

Cuyuna Range

HILLCREST (Ironton)—Viaduct and approaches now being installed for Northern Pacific spur to enter property.

Mesabi Range

ALEXANDRIA (Chisholm)—Shaft now down to orebody, drifting begun.

LAMBERT (Hibbing)—Preparations being rushed for opening this new property.

UTICA (Hibbing)—New shaft now being put down, and old shaft being repaired.

HAROLD (Hibbing)—New engine and dry house being built by Arthur Iron Mining Co.

LAMBERT (Hibbing)—Butler Bros. will start stripping this property within few days. Contract was let this week.

GRANT (Buhl)—Butler Bros. will strip 1,500,000 cu.yd. of overburden here this winter. Mine was heavy shipper this year.

GLEN (Chisholm)—Electric-haulage system new being installed. Upon its completion mine will immediately begin stockpiling.

LEONARD-BURT (Chisholm)—Large amount of test pitting now being done preparatory to greatly increasing production next season.

GRANT (Buhl)—Inter-State Mining Co., has let contract to Butler Bros. for 1,500,000 yd. additional stripping. Will require two years to complete job.

MISSOURI

EASY EIGHT (Joplin)—Has fine prospect on lease on Nelson land south of city. Operation under way for some time with little success, within the last week or two has been rewarded.

HUNTER & CO. (Joplin)—Has recently opened unusually good lead and zinc mine on Tim Malloy land, west of Joplin. Shaft is down about 85 ft. Struck first run at 75 ft.; still sinking in good ore.

MONTANA

Hill County

HAVRE NATURAL GAS (Havre)—Ditching for natural-gas pipe from well east of Havre to city, started Oct. 21. Main artery will traverse county road; laterals will be cut so as to supply every point of city.

Jefferson County

PICNIC GULCH DEVELOPMENT (Wickes)—Company, consisting of Butte mining men recently organized to develop group of four claims near Wickes. Claims show copper and are part of holdings of Wickes-Corbin Copper Co. New management expects to be taking out ore within month.

Silver Bow County

DAVIS-DALY (Butte)—Development work on the 2,500-ft. level of Colorado mine continues to prove satisfactory and orebodies opened up so far show indications of continuing. Total tonnage for October between 2,500 and 3,000 tons, average 7 to 8% copper. Planned to change shaft between 1,700 and 1,900-ft. levels, where it has but one compartment, by constructing two additional compartments, making entire shaft a three-compartment shaft from top to 2,500-ft. level.

ANACONDA (Butte)—Extensive preparations made for development of 70 acres of unexplored ground recently acquired, lying south of its Belmont mine and of Davis-Daly property. It is understood crosscut will be run from Belmont shaft into new territory and under property taken over by company on 40 years' lease. It lies in a part of Butte district that has attracted a great deal of attention following Davis-Daly opening of its 2,500-ft. level. Rumors that company is to take over Butte-Duluth getting more persistent.

BUTTE & GREAT FALLS (Butte) — With arrival of big transformer Oct. 14 that is to complete power installation, it is expected unwatering 350-ft. shaft will begin at once and as soon as that is finished development work will be started. Mine is most northerly in Butte district, located about 3 mi. north of Anaconda mine. As soon as shaft is unwatered, it will be sunk to 500-ft. level and crosscut will be started from there to Genevieve vein. Crosscut on 300-ft. level which already cuts Genevieve vein will be continued to determine extent of orebody.

PLACER LITIGATION IN U. S. SUPREME COURT—On Oct. 19 U. S. Supreme Court in case of Olivia H. Hopkins, Washington-Butte Mining Co. and Anaconda Copper Mining Co. against Frank Walker and 20 others, granted the latter 30 days in which to file brief in answer to appellant's brief asking supreme court to review action of U. S. district court of Montana in this litigation. Suit involves title to portions of Butte and Boston placer mining claim in the Butte district, lands in controversy having been held by aforesaid mining companies for more than 20 years, but are now claimed by Walker and others under lode filings. Lower court held it

had no jurisdiction and supreme court is asked to take jurisdiction and to sustain title of mining companies.

BUTTE & SUPERIOR (Butte)—In answer to inquiries as to probable effect of pending litigation between Elm Orlu and Butte & Superior, Hayden, Stone & Co., closely connected with management of company, has issued statement to effect that ground under dispute comprises not more than 25% of Butte & Superior's holdings on main Rainbow lode; this ground has not been touched by either company for mining purposes since present management came into control, nearly 4 years ago. Should Butte & Superior be defeated in suit, this would entail no loss as regards present earning capacity. Should it win its claim to disputed ground, this would add just so much to workable area of property.

NEVADA

Esmeralda County

GOLDFIELD CONSOLIDATED (Goldfield)—During September total production was 32,500 tons, from which resulted net realization of $112,847. There were 2,204 ft. of development work performed during month at cost of $4.60 per foot.

NEW GOLDFIELD SIMMERONE (Goldfield)—In a short raise above 100-ft. level 4 ft. of $300 ore has been opened. Drifts on the 100-ft. and 250-ft. levels are being extended to catch extension of shoot.

REORGANIZED KEWANAS (Goldfield)—On 838-ft. level about 300 ft. northerly from main winze an east crosscut passed through 45 ft. of vein matter showing stringers assaying from $10 to $50 per ton and exposed about 12 in. of $20 ore on hanging wall. Another east crosscut is being started 75 ft. farther north from same drift.

Nye County

TONOPAH ORE PRODUCTION for week ended Oct. 23, totaled 9,704 tons valued at $200,632. The producers were: Tonopah Belmont, 2,919 tons; Tonopah Mining, 2,850; Tonopah Extension, 1,850; Jim Butler, 1,050; West End, 760; miscellaneous leasers, 275 tons. Bullion shipments amounted to about $177,000.

MONTANA TONOPAH (Tonopah)—About 45 men are engaged operating various leases. Several hundred tons of ore shipped first half of October varied from $25 to $50 per ton.

PIONEER CON. MINES CO. (Pioneer)—Scale of operations to be increased on Nov. 1 and mill to be operated continuously. Present production is from above depth of 250 ft. and from stopes varying from 5 ft. to 20 ft. in width.

MANHATTAN DEXTER (Manhattan)—Milling of 37 tons of ore extracted by Glavinich-Choklat lease on extension of Shea vein in Union Nine Claim gave amalgam return of $1,150; average of $31 per ton from plates; milling made in War Eagle mill under the supervision of J. J. Griffith.

SUNSET MINING AND DEVELOPMENT (Rhyolite)—Mill now treating 50 tons per day of $4 to $10 ore. Installing additional equipment to raise capacity of plant to 100 tons per day. Main tunnel now in 2,200 ft. with 800 ft. farther to go to cut Denver vein. Present output is from Hobo and Eclipse veins.

MANHATTAN M. AND O. (Manhattan)—Plan for consolidation of main producing properties on Litigation Hill, with Manhattan Milling and Ore Co.'s plant to be included in merger, so that as soon as operation is started new company will be able to treat its ores in its own mill, and thus do away with high custom-mill rates, is well under way.

Storey County

ANDES (Virginia)—Explored old stopes above 175 level and put in chutes; ore will be taken through Central tunnel.

MEXICAN (Virginia)—Face of southwest drift 2,500 level shows 2 to 3 ft. of quartz of low assay value. East crosscut No. 2-A started on 2,700 level. Mill crushed 286 tons of ore averaging $13.38 per ton.

CROWN POINT-BELCHER (Gold Hill)—Water now 60 ft. below 1,600 station; 37 cars mill rock saved from No. 1 raise on Belcher 1,300 level and 9 cars of fill on 1,400 level. Jacket mill received 880 tons dump rock and 91 tons mine rock and shipped 1 bar bullion.

SIERRA NEVADA (Virginia)—Jointly with Union opening southwest drift on 2,500 level to Union shaft station and raising to 2,450 level. Sierra Nevada west crosscut on 2,500 level advanced 15 ft.; ore from $11 to $130 per ton; face in ore averaging $130, with no indication of passing through the vein.

CON. VIRGINIA AND OPHIR (Virginia)—West crosscut on 2,700 level to pick up east vein was continued. Ophir 2-compartment winze 2,500 level sunk 5 ft. on vein; saved 10 cars of ore averaging $7.80 per ton. Central tunnel vein 250 ft. level now 2 sets wide.

UNION CON. (Virginia)—Raise in No. 1 stope 2,500 level extended 5 ft.; north end in ore averaging $79 per ton; Central averaging $12; south end in good milling ore. Face of north drift from 47-ft. point in raise samples $889 per ton. Saved from this stope 108 cars of ore averaging $26.90 per ton; from No. 3 stope extracted 17 cars averaging $10.26 per ton.

NEW MEXICO

Grant County

WALDO (Lordsburg)—Operation of lead mill has ceased. Company will do mining on small scale and later resume milling operations.

CARLISLE MINE (Steeplerock)—Operations suspended pending purchase and arrival of larger mining equipment. Work on Jim Crow will be resumed.

ECLIPSE MINING AND MILLING CO. (Steeplerock)—Company has been organized by Messrs Kalar, Waite, Watson and Allen to operate property owned by G. A. Kalar in Steeplerock district.

AZURE MINING (Tyrone)—Contention mine in Tres Hermanas Mountains of Luna County, has been taken over by Azure Mining Co., from Dr. S. D. Swope. Azure interests busy in Tres Hermanas. M. L. and J. Doby are sinking shaft on contract for company.

JOHNNIE BULL EXTENSION (Steins)—Mine being operated by Moffitt and Creswell. Shipments being made to smeltery. Excellent grade of copper ore has been developed. Consolidation of copper properties in Steins section pending. May be purchased by Globe, Ariz., capitalists who have been over ground.

Lincoln County

MEHRMANN (Jicarilla)—Strike of sulphide ore carrying gold made by Wm. Mehrmann on Prince Albert claims.

WRIGHTMAN MINES (White Oaks)—Sale is reported to be completed whereby Richard Wrightman takes over practically all producing property in White Oaks region including North and South Homestake, Old Abe, C. A. Stevens and others. Reports state option alone has been granted.

NEW YORK

Niagara County

E. I. DU PONT DE NEMOURS POWDER CO. (Wilmington, Del.)—Will build $500,000 electro-chemical plant at Niagara Falls.

UTAH

Juab County

TINTIC ORE PRODUCTION for week ended Oct. 23 amounted to 121 carloads, estimated at 6,050 tons valued at $150,000, compared with 124 carloads week previous.

Summit County

PARK CITY ORE PRODUCTION for week ended Oct. 23 amounted to 1,921 tons valued at $76,000, compared with 1,614 tons week previous.

SILVER KING COALITION (Park City)—Because of strike, Oct. 26, mines have been closed. An open shop has been in vogue at Park City and this is first labor trouble here in many years.

VIRGINIA

Norfolk County

NORFOLK SMELTING CO. (West Norfolk)—Is smelting low-grade copper, silver and gold ores obtained from Cuba, Venezuela, west coast of South America, Missouri, Central West and Atlantic seaboard as far north as Canada. In connection with this plant, company is completing and putting into operation byproduct sulphuric-acid plant.

CANADA

British Columbia

RETURNS OF PLACER GOLD for province will be higher this year than last. Increase is shown in output of Atlin and Cariboo and considerable gold is being received from points tributary to Grand Trunk Pacific Ry.

NOONDAY (Sandon)—New tunnel is to be commenced and 6-drill compressor installed. New buildings have been constructed on property and surveys made for pipe line.

ENGINEER GROUP (Atlin)—Mill operated by Capt. Alexander yielding from $10,000 to $15,000 a month. Ore is free milling. On Gleaner group, adjoining Engineer, development is being carried on, and a shipment of gold ore is being made to smeltery.

GLOSSY GROUP (Highland Valley)—S. P. Dunlevy, interested in bond on this property given by J. W. Burr and others of Ashcroft, states that 22 men are employed doing development work. Shaft is down 26 ft. and shows 5 ft. of ore assaying $28 per ton mainly in copper. Car of ore being shipped to Tacoma smeltery this month.

Ontario

SCHUMACHER (Porcupine)—October production approximately $20,000.

SENECA-SUPERIOR (Cobalt)—Reported silver is being produced for 6.3c. an ounce.

McINTYRE (Porcupine)—Is increasing capacity of mill to provide for new ore that will shortly come from Jupiter.

BRUCE COPPER MINE (Bruce)—Mond Nickel Co. has taken over this property and is now shipping to its smeltery at Coniston, Sudbury District.

TOUGH OAKES (Kirkland Lake)—Made net profit of $58,000 in September. Ore being developed on 400-ft. level is richest ever discovered in mine.

PEARL LAKE (Porcupine)—Suit brought against Burr Cartwright by Louis Streuber for financial irregularities has been dismissed. This leaves property clear for McIntyre, which has bought control.

LA BELLE (Kirkland Lake)—Is name of new company with capital of $2,000,000 which has been organized to handle Loring property. Underground work has been stopped pending installation of plant. Reported vein is about 10 ft. of $15 ore.

CANADIAN COPPER (Sudbury)—Has placed all smeltery and surface men on 8-hr. basis, with same pay they formerly received for 10 and 12 hr. For small number of men whom company is unable to put on 8-hr. basis, pay will be increased. Miners who are now receiving $3.50 for 8 hr. will receive an increased wage.

DOME LAKE (Porcupine)—Has produced $86,082 since beginning of year from 9,318 tons of ore; average recovery $8.20 per ton. Mining and milling costs for period, $6.14 per ton; extraction about 80%. Subscriptions have been asked for 500,000 shares of new stock to provide money to build cyanide plant.

Quebec

TIMMINS-McMARTIN SYNDICATE (Montreal)—Has taken option on Cheney copper property near Thessalon. Taking over of this property indicates revival in district long known for its copper deposits, but abandoned for many years.

The Market Report

Metal Markets

NEW YORK—Nov. 3

All of the principal markets were distinctly stronger during the last week, a good volume of business being transacted in each case, although there was less activity in spelter than in the other metals.

Copper, Tin, Lead and Zinc

Copper—A large business was done during the week both with European and domestic consumers. With certain producers the foreign business predominated, while other producers reported the larger proportion of domestic sales. Several large contracts were entered into, covering lots of one million to four million pounds. Business in wire bars was pretty good, domestic wire drawers exhibiting considerable interest in the market. Orders for cakes also were placed freely, indicating that the rollers of copper sheets are doing a better business. It is the common belief that domestic manufacturers, generally speaking, have entered into large contracts for their goods for which they have not yet bought the raw material, while they have let their stocks run down pretty low. On the other hand, electrolytic refiners report no increase in the stock at refineries.

In the early part of the week sales were made chiefly at 17⅞@18c., delivered, regular terms. Some of the producers who had sold all they wanted to at 18c. raised their asking price to 18⅛ or 18¼c., in the latter part of the week, but up to the close of the week the market had not reached such figures. At the close, a considerable quantity of copper was still offered at 18c., regular terms. In England electrolytic copper was sold at £89@89½, this being the general price of the producers. What this would net to producers here depended largely upon the freight rate, the deduction on that account being pretty large if no room previously engaged were available. The freight rate has now risen to 60s.. per ton for November-December shipments.

Tin—The price of this metal rose under the influence of rather heavy buying, which is attributed chiefly to the improvement of business in those lines wherein tin is required.

Lead—The continued large business in the early part of the week led the A. S. & R. Co. to advance its price to 4.90c., New York on Friday afternoon. Since then business has been lighter and there has been more competition for what was in sight. The market in St. Louis failed to advance in the same proportion as in New York and now stands at the usual differential. In the New York market certain producers began to shade the generally named price.

There was a good deal of discussion of the conditions which caused the price for lead in London to decline, while it advanced in New York. At one time the London price was £2 below our parity. The weakness in the London market was explained by heavy arrivals in England of lead intended for Archangel which could not be delivered at that port either for lack of freight room or the expected freezing of the harbor. This lead had to be resold in the English market. The subsequent rally in that market indicated that these supplies had been absorbed.

Spelter—The domestic business was practically nil. The foreign business was very much less in volume than in the previous week. That which was done was chiefly for delivery during the ensuing quarter, although some contracts running well into the second quarter of 1916 were made. Certain producers appeared to be willing to sell for delivery at any time in 1916 at prices far below the present market, and some transactions of that sort were made, but they were sporadic rather than general. The way that the price for prime western has maintained itself has caused much surprise. One explanation is that the supply of common spelter has not yet increased as much as was expected, owing to the conversion of so large a proportion of it into superior grades. The accumulation of unsold spelter up to the present time has been chiefly in superior grades. Brass special is quoted at 16@16½c.; high-grade intermediate, 20@22; strictly high-grade is 35c. asked, but it appears to be difficulty salable at any such price. It is impossible to quote the superior grades of spelter with any accuracy, for the official classification no longer rules, these grades of spelter fetching all kinds of prices according to their analysis in each case.

Zinc Sheets—Business has been active, sales good but with no material change in quotations. The base price for carload lots is $16 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—Conditions have not changed. Stocks of foreign material are small, and the chief domestic producer declines to quote for early delivery. Prices are high, 55@57c. per lb. being asked for No. 1 ingots, New York, spot. No quotations on futures.

It is reported that negotiations are forward for the sale of the property of the Southern Aluminum Co. to parties who are said to represent the Aluminum Co. of America.

Antimony—Business continues rather active and prices are firm. Chinese and other ordinary brands are 35@36c. per lb.; while 45@46c. is asked for Cookson's.

DAILY PRICES OF METALS IN NEW YORK

Oct. Nov.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc
			Electrolytic, Cts. per Lb.	Spot, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	St. Louis, Cts. per Lb.
28	4.6250	49¼	17.70 @17.80	34¼	4.75 @4.90	4.65 @4.70	12.50 @14.50
29	4.6538	49⅜	17.70 @17.80	35	4.80 @4.90	4.65 @4.75	12.50 @14.50
30	4.6425	49⅜	17.70 @17.80	35	4.90	4.70 @4.75	13.00 @14.50
1	4.6200	49¼	17.70 @17.90	36	4.90	4.72½ @4.77½	13.50 @14.50
2	.....	...	..... 17.80	...	.... 4.87½	..... 4.72½	..... 13.50
3	4.6350	49⅜	@17.90	35¼	@4.90	@4.77½	@14.50

The quotations herein are our appraisal of the average markets for copper, lead, spelter and tin based on wholesale contracts for the ordinary deliveries of the trade as made by producers and agencies; and represent, to the best of our judgment, the prevailing values of the metals, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The price quoted for copper on "regular terms" is the gross price including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.20c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Prime Western brands. Only the St. Louis price is herein quoted, St. Louis being the basing market. We quote the New York price at 17c. per 100 lb. above the St. Louis price.

Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

Oct.-Nov.	Silver	Copper				Tin		Lead		Zinc	
		Standard		Electrolytic							
		Spot	3 Mos.	£ per Ton	Cts. per Lb.	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
28	24⅛	72⅛	72⅜	88	18.16	156¼	156	24⅛	4.98	70½	14.55
29	24 1/16	73	73½	88½	18.42	158¾	158¼	23¾	4.96	71½	14.89
30	24 1/16	.....	.....	.....	.....	.....	.....	.....	.....	....	....
1	24⅛	75⅛	75⅜	88½	18.26	163½	162¾	23⅝	4.87	73	15.07
2	24 3/16	74¼	74⅜	89	18.36	161	159¾	24	4.95	75	15.48
3	24¼	74⅛	75	89	18.41	162½	161½	24½	5.06	76	15.69

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for electrolytic, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

Nickel—Quotations for ordinary forms are nominally 45@50c. per lb., according to size and terms of order. A premium of 3c. per lb. is charged for electrolytic nickel.

Quicksilver—An almost total lack of supplies early in the week carried the price of small lots of spot up to $105 and $110 per flask. The arrival of a large lot from California by rail eased off the market and today the New York quotation is $100 per flask of 75 lb. for large lots and $100 also for smaller orders. San Francisco reports by telegraph a firm market at $92@94 per flask. London price is £16 10s. per flask, with 2s. 6d. less quoted by jobbers.

Gold, Silver and Platinum

NEW YORK—Nov. 3

Gold—Exports from Yokohama, Japan, in the eight months ended Aug. 31 were $15,998,250; of silver, $138,144. The gold shipments were chiefly to the United States; they compare with $1,060,640 last year.

Platinum—With supplies still very scarce and no present prospect of an increase the market continues very firm, although little business is doing. Dealers quote $50@55 per oz. for refined platinum and $55@60 for hard metal. All sales are a matter of more or less negotiation.

Silver—During the last few days the demand for silver has been more active and price has advanced to 24¼d. It has not developed whether this advance has been occasioned by the Indian inquiries in conjunction with home mint orders in England, but is fair to infer there has been some outside buying.

Zinc and Lead Ore Markets

PLATTSVILLE, WIS.—Oct. 30

The base price paid this week for zinc ore was $75@80 per ton for 60% grades. The base price paid for 80% lead ore was $54@55 per ton.

SHIPMENTS, WEEK ENDED OCT. 30

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	6,489,290	201,130	485,960
Year	169,316,050	5,884,340	22,724,730

Shipped during week to separating plants, 5,584,440 lb. zinc ore.

JOPLIN ,MO.—Oct. 30

Blende, high price $93; base per ton 60% zinc, premium ore $90; medium grades $89@85; lower grades $84@80; calamine base per ton of 40% zinc, carlots, $58@62.50; average selling price, all grades of zinc, $82.67. Lead, high price $55.60; base per ton of 80% metal content $50@55; average, all grades of lead, $51.84 per ton.

SHIPMENTS WEEK ENDED OST. 30

	Blende	Calamine	Lead	Values
Totals this week.	9,750,830	815,740	1,560,710	$477,680
Totals 10 mos..	479,281,020	33,984,170	74,595,970	$21,178,570

Blende value, the week.....$412,720; 10 months, $18,388,410
Calamine value, the week..... 24,520; 10 months, 836,860
Lead value, the week..... 40,440; 10 months, 1,953,300

Iron Trade Review

NEW YORK—Nov. 3

The iron and steel markets are extremely active and new business is coming forward rapidly. The domestic business is increasing fast, consumers becoming anxious about getting in their contracts for 1916 business so that their deliveries will not be delayed by the rush of foreign trade.

The Pennsylvania R.R. order for rails is 175,000 tons and is divided among the Cambria, Pennsylvania, Bethlehem and Lackawanna steel companies and the Steel Corporation.

The Attorney General has taken the first steps for an appeal to the Supreme Court from the decree of the Circuit Court setting aside the suit of the Government to dissolve the United States Steel Corporation.

The stockholders of the Thomas Iron Co. at a special meeting held Oct. 28 voted to accept an offer of $3,500,000 for their property. The offer was originally $3,000,000, but a higher bid was made the day before the meeting and the purchasers raised their bid by $500,000. This will net the stockholders about $56 per share of $50 par value, after all debts are paid. The purchaser is N. C. Kachelmacher, of Hocking, Ohio, but it is not known whom he represents.

The latest statement is that W. H. Donner has exercised the option which he held on both the Pennsylvania Steel and the Cambria Steel stock owned by the Pennsylvania R.R. Co., and will therefore control both those companies.

PITTSBURGH—Nov. 3

(By Telegraph)

The position of the steel mills has not changed since the last writing, except that the demand seems to be more intensive and the pressure for finished steel greater than it was.

Buyers are still more eager to purchase finished steel products, while mills are still more reserved about making commitments. Current bookings of the mills in specifications against contracts are running much heavier than was anticipated, recent sharp advances having caused buyers to specify to the limit. The majority of large contracts for bars, plates and shapes, for instance, are at 1.25c., while the present market is firm at 1.50c., and the contracts will yield the mills' business, up to the expiration of contracts at the end of the year, that will probably require three or four months of the new year to work off.

Finished steel prices are now at an average level slightly above the highest prices reached in the last movement, which culminated in the winter of 1912-3 and prices seem to be advancing more sharply than ever. The trade is entirely at sea as to what to expect, for precedents no longer count and the demand seems to be almost unlimited.

The sensation of the week is found in the very large orders for pig iron which have been placed with the merchant furnaces, indicating that the steel companies cannot provide themselves with pig iron equal to the current demand. The Youngstown Sheet & Tube Co. is today closing for 10,000 tons of basic pig and as this finishes its purchases for the present, announcement is made of the buying which began several days ago, the total being 75,000 tons of basic and 25,000 tons of bessemer for delivery up to April 1, 1916, at $15.50 Valley furnace for the basic and $16 Valley for the bessemer. The Jones & Laughlin Steel Co. is understood to have bought 30,000 tons of basic iron, the Allegheny Steel Co. 12,000 tons of basic, the Republic Iron and Steel Co. 8,000 tons of bessemer, making the total purchases of bessemer and basic iron now reported for Pittsburgh and Valley steel mills 150,000 tons. There have also been purchases of about 75,000 tons by Ohio River steel interests, including the Wheeling Steel & Iron, the Portsmouth Steel, the Newport Steel and the American Rolling Mill Co. The market today is very strong at $15.50 Valley for basic and $16 Valley for bessemer pig. With the prospect that should any considerable demand in addition come forward, it will advance the market to $16 for basic and $16.50 or $17 for bessemer iron. The buying movement so often predicted seems to have fully set in.

IRON ORE

Rather active inquiries have been made in the East for low phosphorus ore, which is just now in demand. It is said that one lot of 10,000 tons Spanish ore has been sold to a Pennsylvania furnace at about 10c. per unit, delivered.

COKE

Coke production for the past week in the Connellsville region is reported by the "Courier" at 428,319 short tons; shipments, 437,548 tons. Shipments of Greensburg and Upper Connellsville districts, 43,995 tons.

On appeal from the Court of Common Pleas the Supreme Court of Pennsylvania has decided that the law of 1913, taxing anthracite coal produced, is unconstitutional. The money collected under this act must be returned. The legislature passed a new law in 1915, and it is said that this also will be contested.

In Philadelphia Oct. 29 the final decree in the anthracite trust cases was filed in the United States Circuit Court in Philadelphia. While dismissing most of the original complaint the court maintains that the union of the Philadelphia & Reading Coal and Iron Co. and the Lehigh & Wilkes-Barre Coal Co., through the instrumentality of the Reading Co., the holding corporation, is a combination in restraint of trade and violates the anti-trust act of 1890.

Within 90 days the defendants are ordered by the decree to submit to the court a plan for the disposal by the Central Railroad Co. of New Jersey of all the stocks, bonds or other securities of the Lehigh & Wilkes-Barre Coal Co., now owned or in any manner controlled by it.

Chemicals

NEW YORK—Nov. 3

The general market is not especially active and is rather irregular in spots.

Arsenic—Business is quiet and without material change. Quotations are $3.50 per 100 lb. for large lots and $3.75@4 per 100 lb. for smaller orders.

Copper Sulphate—Business continues on a fair scale and no considerable change is noted. Quotations are $6.50 per 100 lb. for carload lots and $6.75 for smaller parcels.

Nitrate of Soda—The market is quiet and substantially unchanged. The current quotations are 2.45c. per lb. for spot and early deliveries.

Assessments

Company	Delinqe	Sale	Amt.
Aetna, Ida.	Oct. 16	Nov. 15	0.001
Argenta, Ida.	Oct. 11	Nov. 13	0.001
Blue Bull Reorg., Nev.	Nov. 1	Dec. 6	0.01
Coeur d'Alene Inv., Ida.	Oct. 25	Dec. 6	0.002
Comstock, Ida.	Sept. 30	Oct. 30	0.001
Copper Mt. M. & D., Ida.	Oct. 28	Dec. 1	0.002
Danley-Lloyd, Utah.	Nov. 14	Nov. 30	0.0025
Diam'field Black Butte, Nev.	Oct. 4	Nov. 4	0.01
Eagle Mt., Ida.	Oct. 15	Nov. 15	0.0005
Eastern Star, Ida.	Oct. 29	Nov. 29	0.002
E. Hercules Ext., Ida. (post.)	.....	Nov. 11	0.0015
Enterprise, Ida.	Oct. 15	Nov. 15	0.002
Four Timbers, Wash.	Oct. 4	Nov. 4	0.001
Friend, Wash.	Oct. 18	Nov. 10	0.002
Giant M. & D., Ida.	Oct. 7	Nov. 8	0.003
Great Western, Nev.	Nov. 15	Dec. 7	0.001
Hancock Cons., Mich.	Jan. 3	.....	1.00
Idaho-Nevada Exp., Ida.	Nov. 1	Dec. 1	0.002
Idora, Ida.	Oct. 11	Nov. 11	0.005
Lewis & Clark, Ida.	Oct. 15	Nov. 15	0.001
Lucky Swede, Ida.	Nov. 11	Dec. 11	0.002
Military M. & M., Ida.	Oct. 28	Nov. 29	0.0065
Montana Standard.	Nov. 15	Dec. 15	0.005
Nabob, Ida.	Oct. 25	Nov. 15	0.005
Naildriver, Utah.	Oct. 9	Nov. 8	0.02
New Arcadian, Mich.	Dec. 1	.....	0.50
New Baltic, Mich.	Jan. 15	.....	0.50
Northern Light, Ida.	Nov. 2	Dec. 2	0.004
O. K. Ex. M. & R., Utah.	Nov. 20	Dec. 15	0.005
Old Vetearn, Ida.	Nov. 1	Nov. 27	0.002
Ophir, Nev.	Oct. 12	Nov. 2	0.05
Oriental, Nev.	Nov. 6	Dec. 7	0.003
Original, Nev.	Nov. 6	Dec. 7	0.003
Pacific M. & M., Ida.	Nov. 10	Nov. 30	0.0005
Phoenix, Mich.	Jan. 1	.....	1.00
Pioche Metals, Nev.	Oct. 20	Nov. 20	0.00¼
Rainbow, Ida.	Oct. 15	Nov. 20	0.002
Royal, Ida.	Oct. 12	Nov. 9	0.0015
Silver Cliff, Ida.	Nov. 8	Dec. 6	0.0025
Silver Moon, Ida.	Oct. 15	Nov. 18	0.005
Silver Pick Cons., Nev.	Oct. 16	Nov. 23	0.01
Sunset M. & D., Nev.	Oct. 18	Nov. 22	0.02
Sunshine, Ida.	Oct. 15	Nov. 15	0.0006
Ton. Gipsy Queen, Nev.	Oct. 29	Dec. 6	0.01
Umatilla Ton., Nev.	Nov. 8	Dec. 13	0.005
Union Cons., Nev.	Oct. 25	Nov. 15	0.05
Wisconsin, Ida.	Oct. 19	Nov. 19	0.003
Wolf Mountain, Utah.	Nov. 12	Dec. 14	0.0025

Stock Quotations

Comstock Tunnel shares have been dropped from listing by the New York Stock Exchange, as the new commission rates make no provision for shares having a par value of $2 and selling for less than $1 per share. Alaska Juneau has been listed by the Exchange.

COLO. SPRINGS Nov. 1		SALT LAKE Nov. 1	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.02¾	Beck Tunnel	.05
Cripple Cr'k Con.	.006	Black Jack	.06½
C. K. & N.	‡.02	Colorado Mining	.06
Doctor Jack Pot.	.09½	Crown Point	.01
Elkton Con.	.25¾	Daly-Judge	6.90
El Paso	.78	Emma Cop.	.26½
Findlay	.03½	Gold Chain	.10
Gold Dollar	.02½	Grand Central	.54
Gold Sovereign	.06	Iron Blossom	.73
Golden Cycle	1.77	Lower Mammoth	.04½
Isabella	.16	May Day	.19½
Jack Pot	.06½	Opohongo	.00½
Jerry Johnson	.06	Prince Con.	.74
Lexington	‡.005	Seven Troughs	.01¾
Mary McKinney	.45	Silver King Coal'n.	3.15
Pharmacist	.008	Silver King Con.	2.02½
Portland	1.67½	Sioux Con.	.02
Raven B. H.	.03	Uncle Sam	.07
Vindicator	1.60	Yankee	.35

TORONTO			Nov. 1
Bailey	.04½	Dome Exten.	.27
Chambers Ferland	.13½	Dome Mines	25.50
Coniagas	3.50	Foley O'Brien	.48
Peterson Lake	.23½	Hollinger	25.00
Right of Way	.04	Imperial	.05½
Seneca Superior	‡.78	Jupiter	.11½
Silver Queen	‡.01	McIntyre	.53½
T. & Hudson Bay	20.00	Pearl Lake	.00½
Timiskaming	.41½	Porcu. Crown	.80
Trethewey	.14	Preston E. D.	.06
Wettlaufer-Lor.	.08	Rea	‡.09

SAN FRANCISCO			Nov. 1
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.04	Belmont	3.50
Andes	.11	Jim Butler	.75
Best & Belcher	.08	Lone Star	.04
Caledonia	.68	MacNamara	.02
Challenge Con.	.08	Midway	.12
Chollar	.03	Mont.-Tonopah	.30
Confidence	.21	North Star	11.00
Con. Virginia	.22	Rescue Eula	.07
Gould & Curry	.04	West End Con.	.65
Hale & Norcross	.05	Atlanta	.24
Jacket-Cr. Pt.	.20	Booth	.36
Julia	.02	C.O.D. Con.	.04
Mexican	.36	Comb. Frac.	.07
Occidental	.78	D'field Daisy	.03
Ophir	.35	Jumbo Extension	1.27½
Overman	.11	Pitts.-Silver Peak	.07
Potosi	.03	Round Mountain	.40
Savage	.08	Sandstorm Kendall	.09½
Sierra Nevada	.08	Silver Pick	.09
Union Con.	.74	Central Eureka	.11

N. Y. EXCH. Nov. 1	
Name of Comp.	Clg.
Alaska Juneau	12½
Am.Sm.&Ref.,com	92⅝
Am. Sm. & Ref., pf.	109½
Am. Sm. Sec., pf. A	.86
Am. Sm. Sec., pf. B.	83
Anaconda	82½
Batopilas Min.	1½
Bethlehem Steel	461
Bethlehem Steel, pf.	166
Chino	53⅜
Colo. Fuel & Iron	57
Crucible Steel	82½
Federal M. & S., pf.	52
Great Nor., ore., ctf.	51
Greene Cananea	39½
Guggen. Exp.	72
Homestake	119½
Inspiration Con.	46
International Nickel	198
Miami Copper	34⅛
Nat'l Lead, com.	67½
National Lead, pf.	110½
Nev. Consol.	15⅝
Ontario Min.	3
Quicksilver	5⅛
Ray Con.	26½
Republic I&S, com.	54
Republic I&S, pf.	104½
SlossSheffi'd, com.	61
Tennessee Copper	63⅜
Utah Copper	73½
U. S. Steel, com.	87
U. S. Steel, pf.	115½

N. Y. CURB Nov. 1	
Alta Con.	.18
Beaver Con.	.30
Big Four	.05
Blue Bell	.02
Braden Copper	11½
Buffalo Mines	.50
Can. Cop. Corpn.	2½
Cashboy	.07½
Chile Cop.	26½
Con. Ariz. Sm.	1⅜
Con. Coppermines	2½
Con. Nev.-Utah	⅜
Dia. Black B.	.05
Florence	‡.44
Goldfield Con.	1⅛
Goldfield Merger	.19
Howe Sound	4½
Kennecott Cop.	53
Kerr Lake	3⅜
La Rose	.45
Magma	14⅜
McKinley-Dar-Sa.	.30
Mines of Am.	2⅜
Mother Lode	.34
Nevada Hills	‡.21
New Utah Bingham	2⅞
Nipissing Mines	6⅞
Oro	.06½
St. Joseph Lead	14½
South Utah	.30
Stand'd Oil of N.J.	488
Standard S. L.	1⅝
Stewart	⅜
Success	.64
Tonopah	5½
Tonopah Ex.	2 3/16
Tonopah Merger	.36
Tribullion	⅜
Yukon Gold	2½

LONDON Oct. 17			
Alaska Tre'dwell	£6	5s	0d
Burma Corp.	1	8	9
Cam & Motor	0	14	3
Camp Bird	0	5	0
El Oro	0	7	0
Esperanza	‡0	7	6
Mexico Mines	‡3	11	3
Nechi, pfd.	‡0	12	6
Oroville	0	14	6
Santa Gert'dis.	‡0	7	6
Tomboy	1	0	0
Tough Oakes.	‡0	6	9

BOSTON EXCH Nov. 1	
Name of Comp.	Clg.
Adventure	2
Ahmeek	397
Alaska Gold M.	32
Algomah	2
Allouez	56
Am. Zinc	69
Ariz. Com., ctfs.	7⅞
Bonanza	.40
Butte-Balaklava	3½
Butte & Superior	67½
Calumet & Ariz.	66½
Calumet & Hecla	556
Centennial	17½
Copper Range	58⅛
Daly West	2⅛
East Butte	13⅜
Franklin	9½
Granby	86½
Hancock	16
Hedley	28
Helvetia	.50
Indiana	5
Island Cr'k, com.	42½
Island Cr'k, pfd.	86½
Isle Royale	28½
Keweenaw	2⅞
Lake	13½
La Salle	5½
Mason Valley	2
Mass	14
Mayflower	4⅜
Michigan	2½
Mohawk	84
New Arcadian	11
North Butte	31⅜
North Lake	1½
Ojibway	1½
Old Colony	3½
Old Dominion	53½
Osceola	87
Quincy	85½
Santa Fe	4
Shannon	7½
Shattuck-Ariz.	32½
Superior	28½
Superior & Bost.	2⅜
Tamarack	52½
Trinity	10
Tuolumne	.35
U. S. Smelting	43
U. S. Smelt'g, pf.	47½
Utah Apex	3
Utah Con.	13
Victoria	3
Winona	3
Wolverine	60
Wyandot	1½

BOSTON CURB Nov. 1	
Bingham Mines	7½
Boston Ely	.21
Butte & Lon'n Dev.	.32
Calaveras	1⅜
Calumet-Corbin	.02
Chief Con.	.90
Cortez	.55
Crown Reserve	.50
Davis-Daly	1⅜
Eagle & Blue Bell	1½
First Nat. Cop.	5
Houghton Copper	2½
Iron Cap Cop., pf.	7
Majestic	.63
Mexican Metals	.22
Nevada-Douglas	.65
New Baltic	2½
New Cornelia	8½
Ohio Copper	.13
Oneco	1
Raven Copper	.10
Rex Cons.	.51
Smokey Dev.	.15
So. Lake	5½
Tonopah Victor	.30
United Verde Ext.	5½
Utah Metal	8½

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067	50.241	26.669	26.788	23.708
April	59.490	58.519	50.250	27.416	26.958	23.709
May	60.361	58.175	49.915	27.825	26.704	23.570
June	58.990	56.471	49.034	27.199	25.948	23.267
July	58.721	54.678	47.519	27.074	25.219	22.597
August	59.293	54.344	47.163	27.335	25.979	22.780
September	60.640	53.290	48.680	27.986	24.260	23.591
October	60.793	50.654	49.385	28.083	23.199	23.925
November	58.995	49.082	.....	27.263	22.703	.....
December	57.760	49.375	.....	26.720	22.900	.....
Year	59.791	54.811	.....	27.576	25.314	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic		London Standard		London Electrolytic	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.491	14.394	65.259	63.494	70.188	*
March	14.131	14.787	64.276	66.152	69.170	*
April	14.211	16.811	64.747	75.096	69.313	*
May	13.996	18.506	63.182	77.600	67.786	*
June	13.603	19.477	61.336	82.574	66.274	95.333
July	13.223	18.796	60.540	76.011	64.955	91.409
August	*	16.941	‡	68.673	‡	82.333
September	*	17.502	‡	68.915	‡	85.250
October	*	17.686	‡	72.601	‡	88.000
November	11.739	.....	53.227	.....	*	.....
December	12.801	.....	56.841	.....	*	.....
Year	.....	.....	.....	.....	.....	.....

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038	48.426	173.619	180.141
April	36.154	47.884	163.963	166.225
May	33.360	38.790	150.702	162.675
June	30.577	40.288	138.321	167.636
July	31.707	37.423	142.517	167.080
August	*	34.389	‡	151.440
September	32.675	33.125	‡	152.625
October	30.284	33.080	‡	151.554
November	33.304	.....	139.391	.....
December	33.601	.....	147.102	.....
Av. year	34.301	.....	.....	.....

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3.937	3.718	19.606	19.122
March	3.970	4.053	3.850	3.997	19.651	21.883
April	3.810	4.221	3.688	4.142	18.225	21.094
May	3.900	4.274	3.808	4.182	18.503	20.347
June	3.900	5.932	3.810	5.836	19.411	25.170
July	3.891	5.659	3.738	5.531	19.051	24.611
August	3.875	4.656	3.715	4.520	‡	21.946
September	3.828	4.610	3.658	4.490	‡	23.151
October	3.528	4.600	3.384	4.499	‡	23.994
November	3.683	.....	3.585	.....	18.500	.....
December	3.800	.....	3.662	.....	19.097	.....
Year	3.862	.....	3.737	.....	.....	.....

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250	8.541	5.100	8.366	21.460	44.141
April	5.113	10.012	4.963	9.837	21.569	49.888
May	5.074	14.781	4.924	14.610	21.393	68.100
June	5.000	21.208	4.850	21.038	21.345	100.614
July	4.920	19.026	4.770	18.856	21.568	97.250
August	5.568	12.781	5.418	12.611	‡	67.786
September	5.380	13.440	5.230	13.270	‡	67.841
October	4.909	12.800	4.750	12.596	‡	66.536
November	5.112	.....	4.962	.....	25.016	.....
December	5.592	.....	5.430	.....	27.369	.....
Year	5.213	.....	5.061	.....	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15 07	14.55	13.91	13.45	14.10	13.95
April	14.90	14.55	13.90	13.45	14.13	13.95
May	14.90	14.61	13.90	13.60	14.27	13.83
June	14.90	14.70	13.90	13.67	13.96	13.77
July	14.90	14.94	13.90	13.91	13.90	13.68
August	14.90	16.01	13.90	15.31	14.08	14.75
September	14.90	16.86	13.90	15.95	14.03	15.70
October	14.84	16.95	13.75	15.96	13.97	15.80
November	14.59	.....	13.43	.....	13.83	.....
December	14.70	.....	13.45	.....	13.83	.....
Year	$14.88	.....	$13.78	.....	$14.01	.....

The Mining Index

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2100—REFINING—The Development of Electrolytic Copper Refining. Lawrence Addicks. (Advance copy, Internat. Eng. Congress, Sept., 1915; 7 pp.)

2101—SMELTING—Advances in Copper Smelting. Frederick Laist. (Advance copy, Internat. Eng. Congress, Sept., 1915; 14 pp.)

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2105—SULPHIDES of Copper, The. Eugene Posnjak, E. T. Allen and H. E. Merwin. (Econ. Geol., Sept.-Oct., 1915; 44 pp., illus.) Thermal, chemical, microscopic and crystallographic studies. 60c.

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GOLD AND SILVER—CYANIDING

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